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Women's Intra-Household Bargaining Power and Child Welfare Outcomes: Evidence from Sub-Saharan Africa

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Thesis submitted for the Degree of Doctor of Philosophy in Economics
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University of Sussex

Declaration

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another university for the award of any other degree.

Signed:

Sarah Saaka

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Sarah Saaka, Doctor of Philosophy in Economics

**WOMEN'S INTRA-HOUSEHOLD BARGAINING POWER AND CHILD WELFARE OUTCOMES:
EVIDENCE FROM SUB-SAHARAN AFRICA****SUMMARY**

This thesis addresses three key research questions, which explore empirically, the links between women's relative intra-household bargaining power and child welfare outcomes in Sub-Saharan African households.

The first empirical study examines the effects of a woman's decision-making power on the nutrition outcomes of Ghanaian children under five years of age using two measures. First, using an index-based measure of a woman's overall involvement in household decision-making, relative to her partner, indicates positive effects of a mother's bargaining power on child nutrition. Second, measures of bargaining power which further distinguish between equal power and sole decision-making power relative to her partner for separate spheres of decision-making are used. The results show that better child nutrition outcomes are associated with being in households where the power balance between women and their partners is equal. This suggests that even though child nutrition is positively associated with women's bargaining power, policy interventions that promote balanced bargaining power may better enhance child nutrition outcomes.

In the next chapter, the impact of another aspect of intra-household bargaining power, a mother's report of her experience of domestic violence on child survival, is studied using Demographic and Health Survey data from six sub-Saharan African countries, spanning 2008 and 2013. The analysis of a mother's experience of emotional, physical and sexual violence on infant mortality, nutrition and illness, provides limited evidence that women's exposure to domestic violence is a threat to infant mortality. The results of this study also show that while women's exposure to violence might potentially affect child survival, its effects are varied across countries.

The third substantive chapter studies the effects of a woman's relative bargaining power on boys' and girls' educational achievement in Ghana measured by test scores, while a woman's ownership of a range of economic assets relative to her partner are used as measures of her bargaining power. Based on data from a national survey by the University of Ghana and Yale University's Economic Growth Centre in 2008/2009, the study finds limited evidence that a woman's ownership of household durable assets and agricultural land, are more significantly associated with the educational achievement of children. The conclusion from this study is that based on the evidence available, other factors seem to be more important for children's educational achievement than the relative bargaining power of their mothers.

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Dedication

To Mama and Adom,
and to the generations of women and children the world over who have never ceased
to intrigue me during the course of my studies.

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List of Abbreviations

BMI	Body Mass Index
BP	Bargaining Power
CTS	Conflict Tactics Scale
DHS	Demographic and Health Survey
DSP	Digit-span Test
DV	Domestic Violence
EGC	Economic Growth Centre
GER	Gross Enrolment Ratio
GHDHS	Ghana Demographic and Health Survey
GHC	Ghana Cedis
HFA	Height-for-Age
ISSER	Institute of Statistical, Social and Economic Research
MOE	Ministry of Education
NER	Net Enrolment Ratio
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
RPCT	Raven's Pattern Cognitive Test
SAGE	Schooling for Age

SSA	Sub-Saharan Africa
U1M	Infant mortality
UNCF	United Nations Children's Fund
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WFA	Weight-for-Age
WFH	Weight-for-Height
WHO	World Health Organisation
ZINB	Zero-Inflated Negative Binomial

1. Introduction

Much of the research that focuses on bargaining within married couples has significant intergenerational implications. Decisions about how much education or health care to provide to individual children or how to bequeath other assets across generations have significant implications for the intergenerational transmission of poverty and the potential for upward mobility across generations. However, children are not typically modelled as actors in these scenarios.

Doss (2013) Page 58

Investments in children's survival from birth and their subsequent physical and mental development during the early years of life are arguably one of the most beneficial investments in human capital. As suggested by Cunha and Heckman, (2010) and several other studies¹ investments in the cognitive and non-cognitive development during the early years yield the highest returns relative to similar investments made during other stages of the life cycle. The death of a child is a waste of potential human resources and when a child does survive, their nutrition and health during the first five years of life

¹ A review of the evidence spanning several decades of studies is found in Currie, J., & Almond, D. (2011).

determines their physical, cognitive and social development, which are predictors of lifetime earnings. Investments made into the education of children also influence lifetime productivity and incomes. Thus for poorer households facing resource constraints, channelling resources into children's welfare may be vital for breaking the cycle of inter-generational poverty, while acting as a stimulus for economic growth at the macro level for developing economies².

Several factors are known to account for children's health and educational outcomes, most of which have been studied extensively. A more recent, but relatively less studied strand of this literature is the potential importance of women's relative influence or control in household resource allocation, termed "intra-household bargaining power", in explaining children's welfare outcomes (Doss, 2013). There is evidence from both developed and developing countries that differences in women and men's control over the allocation of household resources lead to different welfare outcomes for its members including children (Lundberg, Pollak and Wales, 1997; and Duflo, 2003). Thus, in poorer households, due to inequalities in intra-household resource allocation, it matters who wields greater control or "bargaining power" within such households since small changes in relative control or power can make significant changes to child welfare outcomes. In this regard, researches have turned to intra-household bargaining models to understand the links between child welfare outcomes and the exercise of relative bargaining power between women and men.

UNICEF (2011) describes Women's intra household bargaining power. As "the ways in which women and men participate in and have control over decisions about [*the*

² See Strauss and Thomas, 1998; Alderman, Hoddinot and Kinsey, 2006; Schultz, 2010; Hoddinott, J, Maluccio, J, Behrman, J. R., Martorell, R, Melgar, P., Quisumbing, A.R., Ramirez-Zea, M., Stein, A. D. & Young, K. M., 2011

allocation of household resources". A growing body of literature highlights the importance of women's relative bargaining power for child welfare outcomes (for example, Quisumbing and Mallucio, 1999; Doss, 2006; and Fafchamps et al, 2009) however, the evidence remains mixed. A key challenge faced in the estimation of the impact of women's intra-household bargaining power on child welfare outcomes by researchers has been primarily with the measurement of women's bargaining power which according to Doss,(2013), raises issues related to the identification of the effects of bargaining power.

The first major constraint faced in most studies lies with the fact that bargaining power is not observed and is therefore very difficult to measure. This calls for finding "good proxies" or measures of women's bargaining power³ Doss (2013). Yet, for a long time, data with adequate measures of bargaining power, which also included child welfare outcomes of interest, had been uncommon, more so for developing countries. Therefore, previous studies either used what proxies of bargaining power was available.

Where studies exist, obtaining 'direct measures of bargaining power' (Doss, 2013), attributable to the individual woman in question have remained challenging. Until the more recent Demographic health surveys (DHS) incorporated a module with a focus on measures of women's status and relative empowerment, it was difficult to obtain information from household survey data with such direct or individual measures of a woman's relative power or control in the household⁴. A few known studies in the past either collected their own data often on a smaller scale, (Fafchamps et al, 2009; Lépine and Strobl, 2003) or relied on natural experiments (Duflo, 2003) for measures of

³ See Doss (2013) for a more detailed review on the different proxies of women's bargaining power

⁴ Except for data on Ethiopia collected in a special project by researchers from Oxford University in Ethiopia

bargaining power. These have so far been the source of the scant evidence from sub-Saharan Africa with direct measures of bargaining power.

The current study therefore seeks to use recently available nationally representative, household survey data with information that provides opportunity for the construction of more direct measures of bargaining power of a woman relative to her spouse. It deviates from most previous studies by its use of decision-making power, a woman's experience of domestic violence and a woman's individual asset ownership, relative to her partner, to examine the links between child welfare outcomes and women's relative bargaining power for sub-Saharan Africa households.

In this regard, this thesis addresses the following key research questions:

1. How are the effects of a mother's relative bargaining power, measured as her relative decision-making power, within the household associated with child nutrition outcomes?
2. What are the effects of a mother's (lack of) bargaining power, measured as her reported exposure to domestic violence, on child survival? and
3. How is a mother's bargaining power, measured as her relative share of economic assets within the household, related with children's educational achievements?

Each of the research questions above is addressed in an empirical study, which constitutes a core chapter of this thesis. The studies are based on Sub-Saharan Africa because the region has a high incidence of poverty, accounting for a high proportion of the world's poorest households and high levels of child mortality, child under-nutrition and poor child health. Recent evidence shows that with 92 out of every 1000 children

born, dying before their fifth birthday in 2013, Sub-Saharan Africa is the region with the highest incidence of child mortality. This is more than fifteen times the developed country rate of 6 per 1000 live births, and almost twice the mean developing country rate of 50 for every 1000 live births (World Bank, 2014).

Globally, under-nutrition accounts for half of the deaths of children before their fifth birthdays with a relatively large share of under-nourished children living in sub-Saharan Africa. For example, Africa alone accounted for one in three of the 25% percent (or 161 million) children globally who were stunted in 2013 (UNICEF/WHO/The World Bank, 2014). For Sub-Saharan Africa (SSA) earlier evidence indicates that at least one third of children who die before the age of five, die from starvation (UNCF 2011) with disease and injury being the other important factors accounting for child mortality.

Also, as a region, sub-Saharan Africa has one of the highest numbers of children outside of school, and schooled children who end up with insufficient skills required for their adult life of work. According to UNESCO (2012), apart from children of primary school age who are out of school, there are about 25% of children in school worldwide who fail “to learn the basics” by the time they reach grade 4, a large percentage of these children live in Africa.

Our findings corroborate those of earlier studies regarding the importance of women’s intra-household bargaining power in determining child welfare outcomes. The first two studies provide varying degrees of evidence, which suggest that children’s health -their survival and nutrition outcomes are positively associated with women’s intra-household bargaining power.

From the first study I find, for Ghana that a mother's overall involvement in household decision-making is positively associated with child nutrition outcomes. Further, the study adds to the limited evidence in the literature that balanced power between men and women is more positively associated with child nutrition outcomes than an over-concentration of power in any one parent.

The second empirical study of six sub-Saharan African countries however suggests limited evidence of the total effects of a mother's experience of domestic violence on infant mortality. Nor do we find any consistent evidence of maternal factors mediating the effects of women's reported experience of domestic violence on infant mortality.

The results from the third study also suggest the existence of rather weak links between a woman's ownership of assets, relative to her partner, and child education outcomes. It appears, based on the data available, that certain individual child, schooling and location characteristics are more important predictors of their achievement in mathematics and English than their mother's relative ownership of assets.

These conclusions arise from the analysis of nationally representative household survey data collected in Sub-Saharan Africa. The data sets come from two sources. The first two empirical chapters use data from the Demographic and Health Surveys (DHS) collected between 2008 and 2013 from Ghana, Burkina Faso, Cote d'Ivoire, Kenya, Nigeria, and Zimbabwe. The third empirical study uses data from a nationally representative Ghanaian household survey conducted as a baseline of what was intended to be a panel starting in 2009/2010 by Yale University's Economic Growth Centre and the Institute of Statistical, Social and Economic Research in Ghana (ISSER). These datasets are chosen because they provide information on the relevant child

education, health and nutrition outcomes of interest as well as information used in computing a range of measures of women's relative power within the household.

The studies exploit the availability of information on child anthropometric measures (to measure child nutrition outcomes), child mortality and child health from the DHS. Measures of women's bargaining power are constructed using information on women's decision-making, their perceptions, and experience of domestic violence. This information in addition to several maternal and household characteristics, allow for the estimation of the effects of women's relative bargaining power on child outcomes while controlling for other possible confounding factors. The 2009/2010 ISSER/YALE survey also has information on children's test scores in mathematics and English which are used as measures of educational achievement, as well as other measures of children's educational outcomes, cognitive measures, household, school and community characteristics required as controls in the estimation of the effects of women's bargaining power on child educational achievement. The availability of information on individual asset ownership within the household makes it possible to compute measures of women's bargaining power based on her relative shares of a range of economic assets.

All three studies draw on descriptive and regression analytical methods in the estimation of the effects of women's bargaining power on child nutrition and survival. In each study, the estimated empirical models are adapted from basic models of the independent variables of interest based on a widely accepted framework within the literature. These are then extended into models of intra-household bargaining and

estimated using the appropriate regression techniques dictated by the independent variable of interest. Details of the empirical strategies are discussed in each chapter.

The rest of the thesis is organised as follows: The next chapter sets out the conceptual framework linking women's intra-household bargaining power to child welfare outcomes, while chapters 3, 4 and 5 are the three substantive empirical chapters, which form the core of this thesis, each constituting a study that addresses one of the key research questions raised earlier. In chapter 3, a study on the effects on the nutrition outcomes of Ghanaian children, of women's relative involvement in household decision-making (compared with their partners) is presented. Chapter 4 focuses on the links between domestic violence and child survival in a cross-country study of six sub-Saharan African countries. The study in chapter 5 addresses the effects of women's bargaining power on child educational achievement in Ghana and chapter 6 concludes with the key findings on all three studies.

2. Women's Intra-Household Bargaining Power and Child Welfare Outcomes

2.1 Introduction

This chapter focuses on reviewing the theoretical and empirical literature on intra-household bargaining, empirical measures of bargaining power and analytically identifying its links with child welfare outcomes. It seeks to discuss how child welfare outcomes are measured in this study and what the possible mechanisms of transmission between the outcomes of interest and women's intra-household bargaining power while highlighting the potential limitations associated with the use of selected measures and analytical approaches.

2.2 Intra-Household Bargaining

The earliest known literature to provide an explanation about how welfare outcomes are determined within the household is the Beckerian unitary model (Becker, 1974; Becker, 1981) and its variants. Becker's model, which sought to explain the production and allocation of household resources within the household, was based on the assumption that household members pooled their resources, which were then reallocated by an 'altruistic benevolent dictator', often the head of the household. The unitary model, views the household as a single economic agent whose goal is the maximization of a single household utility function. The model further assumes that the tastes and preferences of household members are homogeneous. Therefore, with no heterogeneity in the preferences of household members, the Beckerian unitary model predicts no

changes in household welfare outcomes with changes in control over household resource allocation.

The reasoning of the unitary model is however at variance with empirical evidence, which suggests that the household is more complex than the model admits. To begin with, households do not always pool resources as suggested by Thomas, (1990); Goldstein (2004), while different welfare outcomes have been shown to result from changes in control over household resources (Duflo, 2003). The unitary model also failed to acknowledge power differences in the household and its potential effects on members' welfare. Yet, studies by Thomas (1990), and Hoddinot, and Haddad, (1995) show differences in household welfare outcomes resulting from changes in power or control by different household members. These weaknesses of the unitary models have increasingly turned researchers on household resource allocation towards the bargaining models.

The more recent theoretical literature on intra-household bargaining is set within the context of collective bargaining models (Manser and Brown, 1980; McElroy and Horney, 1981). These models view intra-household resource allocation as the outcome of negotiations or *bargaining* among individual members of the household. They acknowledge the heterogeneity of members' preferences, which is a deviation from the thinking behind the Beckerian unitary model and its variants⁵. Bargaining models also provide an explanation for the differences in welfare outcomes resulting from changes in relative control of household members over its resources. They are therefore particularly useful for carrying out gendered analyses of intra-household resource allocation often within the context of men and women. For this reason, the bargaining models can also be

⁵ See Manser and Brown, (1980); McElroy and Horney, (1981); Chiappori (1987), Bourguignon et al. (1993), Browning and Chiappori (1998), and Chiappori and Ekeland (2001), among others for a detailed discussion of these.

extended to the analysis of relative parental bargaining power on child welfare outcomes.

The term '*bargaining power*' thus originates from the '*cooperative*' and '*non-cooperative*' bargaining models also sometimes described as *collective* bargaining models (Chiappori (1987), Browning and Chiappori, 1998). Cooperative bargaining models, view marriage as a cooperative game, in which each spouse aims to maximise their utility subject to the constraints of household resources. They assume that there is no information asymmetry in the household, and marriage contracts are fully enforceable. The models further make the assumption that household resources are allocated in a pareto efficient manner, so that it is not possible to increase the utility of one member without reducing the utility of another (Browning and Chiappori, 1998). However, a breakdown in the relationship will occur if the utility of one party falls below their *threat point* or *fall-back option*, which is a measure of their individual utility outside marriage (Manser and Brown, 1980; McElroy and Horney, 1981). Threat points in themselves depend on "Extra Environmental Parameters" or EEPs such as physical, monetary or intellectual assets brought into the marriage, income earned or transfers received. These, according to the collective bargaining models, are what determine the bargaining power of an individual.

Thus, according to the cooperative bargaining models, a spouse whose outside options or fall-back position is stronger would have a greater degree of influence or power in household decisions and greater control in the allocation of its resources. Several factors may influence an individual's fall-back position, and in this regard, EEPs, such as their income, their level of education, assets brought to marriage and assets on divorce, as

well as legislations related to family law and divorce, have typically been used in the literature as measures of bargaining power.

Non-cooperative models on the other hand, vary from cooperative models in their view of divorce being the only option in the absence of cooperation in the marriage. In that regard, they consider the divorce threat point as prohibitively expensive and argue that spouses prefer to settle for a “non-cooperative, voluntary contribution equilibrium in the provision of public goods”. This is an outcome in the absence of agreement, where men and women may not leave, but stay on in the marriage and resort to playing traditional roles and fulfilling the expectations associated with such roles. Lundberg and Pollak (1993) in their “*separate spheres*” bargaining model, thus argue that a marriage’s threat point may be internal to the marriage, and not necessarily external as suggested by the afore-mentioned bargaining models. In non-cooperative bargaining, spouses do not pool their resources, but if they do not cooperate, the resulting equilibrium in the household is inefficient and leaves the entire household worse-off. To avoid such inefficient outcomes, each party is compelled to contribute to household public goods or come to a compromise leading to specialisation in separate spheres or domains based on gender and social norms (Lundberg and Pollak, 2008). In their opinion, changes in bargaining power, can, but do not necessarily lead to different welfare outcomes for members of the household and what might rather matter in changing welfare outcomes may be changes in the marriage market equilibrium⁶.

In spite of their advantages over the unitary model, the collective bargaining models are not without limitations. First, their assumption of perfect information has been refuted

⁶ See Becker, 1991 chapter 3 for a more detailed discussion on the marriage market.

by empirical studies such as Castilla and Walker (2012,2013) from field experiments in Ghana and other developing countries (Baland et al., 2011; di Falco and Bulte, 2011; Boltz, 2015) which show evidence of the tendency of spouses to hide their income from the other party. Consequently, in the absence of perfect knowledge, the threat point or fall-back position may not be easily determined by a spouse who lacks full information. Further, the cooperative models assume that it is easy to exit the marriage in the case of breakdown however the ease of exit from a marriage is not the same for men and women as implied. In practice it is much easier for men to leave a marriage and start a new family elsewhere than it is for a woman to do so, especially where children are involved (Katz, 1997). Moreover, in some societies or cultures, a spouse may not know all their exit options, or may not be able to exercise them due to prevailing socio-cultural norms and or restrictions to their interactions within society. A typical example of such limitations are those experienced by women in certain Middle Eastern cultures whose interactions are restricted due to their dependence on close male relatives to facilitate their social interactions. In such patriarchal societies, the assumptions of the cooperative model will not hold.

With respect to the non-cooperative models, which assume that spouses' circumstances stay the same and outcomes depend on current circumstances including incomes, it is clear that in reality spouses circumstances may change if they receive one off lifetime transfers for example. Lastly, the conceptualisation of bargaining models are based on a westernised view of a dual headed household to the exclusion of single or multiple headed households. For this reason, unless they are modified, bargaining models may not be suited for the analysis of bargaining in households that may be different to the westernised view. The reality in most developing regions of the world however is that

decision making in households involve more than two adults when elderly parents or relatives are part of the household as is often the practice in Asia, or where polygamous families may be common as in Sub-Saharan Africa.

These restrictions notwithstanding, the bargaining models remain a better option for explaining the determination of household welfare outcomes⁷. The current study therefore bases its analysis on bargaining models rather than the unitary model for the following reasons. First, they acknowledge the existence of inequalities in power and preferences within the household and lend themselves to the gendered analysis of household welfare outcomes. Second, they are better at explaining empirically the allocation of resources in the household as shown in several studies (Lundeberg et al, 1997; Duflo, 2003; Fafchamps et al, 2009). It is worth noting however that for the purposes of the studies carried out in the subsequent chapters, the analysis is limited to two headed households and the results are interpreted within the confines of the limitations outlined above.

Thus we next review how intra-household bargaining power is empirically measured in two headed households after which we consider how children's health and educational outcomes are linked with women's intra-household bargaining power.

2.3 Empirically Measuring Intra-Household Bargaining Power

The review of the theoretical household literature in the previous section shows that term *bargaining power* is used within the context of the collective bargaining models.

⁷ See Quisumbing and Mallucio, (2003); Duflo, (2003); Fafchamps et al, (2009) and Schmidt, (2012), for example.

From these models, the bargaining power of any spouse in a two-headed household, depends on their divorce “threat point” (Manser and Brown, 1980; McElroy and Horney, 1981) or their specialised “sphere” of control (Lundberg and Pollak, 1993)⁸. However for the purposes of empirical studies, the challenge is that while bargaining may be taking place implicitly or explicitly within households, it is not easily observed and therefore difficult to measure. Therefore, the question researchers are confronted with in a study of this nature is what makes a good measure of intra-household bargaining power?

From the cooperative bargaining models, bargaining power stems from the threat point of the individual which is in itself determined by their extra household parameters. In this regard, a wide range of indirect measures of women’s intra-household bargaining have emerged which are related to a woman’s exit options but are, at best, proxies of bargaining power and not direct measures in themselves. The more common ones are related to income and employment, education and the ownership of assets (Thomas, 1990, Quisumbing, 1994; Allendorf, 2007). Others include changes in policy, social norms or the legal frameworks governing property rights and inheritance, marriage and family law (Duflo, 2003; Rangel, 2006; Doss, 2013). The non-cooperative models also suggest the importance of spheres of control within the household and traditional gender roles in measuring bargaining power. In the more recent household economic literature, there is an increasing use of indicators of controlling behaviour such as domestic violence and measures of a woman’s involvement in decision-making across a range of household spheres.

⁸ Also defined by Sen (1990) as a function of their “endowments” and “exchange entitlement mappings”.

2.3.1 Indirect measures

Given the multidimensional nature of bargaining power, the use of some of the proxies outlined is not without limitations. Yet with limited availability of data which adequately and appropriately measures bargaining power, few alternatives exist for computing appropriate measures. In such instances, it is important to understand the limitations in interpreting results when proxies are used. Some of these are discussed next.

Education

One of the earlier known measures of women's bargaining power used in the literature is maternal education (Thomas, 1990). A woman's education may be empowering both directly and indirectly as the skills, which enable her to obtain a good education, may also come into play in promoting her preferences and, at the same time, enhance her outside options. However, in communities in which the idea of women working outside the home is frowned upon, a woman's level of education may not be as empowering as it may be in a community in which she is encouraged to work outside the home and earn an income. Second, when a woman's education is used as a measure of her bargaining power, care has to be taken that its effects are properly identified using the appropriate estimation techniques failing which the results may be capturing the impacts of other variables with which women's education may be highly correlated such as her spouse's education or household wealth. Under such circumstances, it is a better approach to use a woman's education relative to her spouse as a measure of bargaining power.

Income and employment

Another common measure of bargaining power is the use of women's earned income and employment, including exogenous increases in women's income (Attanasio and

Lechène, 2002; Duflo, 2003). A woman's ability to work outside the home and earn an income is empowering. It allows her a certain degree of autonomy in making choices and may also add to her ability to influence household resource allocation. However, household decisions of who works and who does not work for an income are made within the household and may be the outcome of bargaining. Therefore, depending on her preferences, a woman's bargaining skills, may result in being able to negotiate with their spouse to be a stay at home mother or work and earn an income.

On the other hand, working outside the home may not only reflect a woman's bargaining skills but it also enhances those skills as work may give her opportunity to learn additional skills that increase her bargaining power. All of these factors can confound the effects of bargaining power in estimations of household welfare and bargaining. Another possible challenge lies with the fact that some of the household welfare outcome variables one might be estimating may be directly affected by a woman's choice to work outside the home. Working outside the home might mean that the woman has less time to spend on her own wellbeing and therefore her children's welfare may be compromised. It may also mean less time spent in food preparation, or even mean a redistribution of household income into work-related needs such as the purchase of work clothing and sometimes the hiring of domestic help, all of which have implications for the welfare of household members and children in particular.

Besides, in as much as working outside the home may expose women to situations through which they learn and increase their bargaining power, work is not necessarily always empowering. Sometimes when women work outside the home, it may limit their leisure time or possibly expose them to unsafe situations. For these reasons, the use of

earned income might make it difficult to accurately identify the effects of bargaining power. Consequently exogenous increases in income have been argued to be better measures of intra-household bargaining power. Studies which use measures based on changes in policy (Lundberg, Pollak and Wales, 1997; Duflo, 2003) have found that exogenous changes in women's income changes the household allocation of resources in favor of children's welfare. None-the-less, it is worth noting that sometimes women may not necessarily have control over their non-labour income transfers. The evidence from some studies on micro-finance schemes suggest that sometimes the support given to women ends up under the control of their spouses (Goetz and Gupta, 1996, Kabeer, 1998, Basu, 2006). In such instances the effect of her bargaining power may be over estimated by the use of the exogenous income transfer.

Asset ownership

Asset ownership is a common measure of intra-household bargaining power. The ownership of assets may provide women with higher outside options. They also are a source of additional income if they are rented out or used in productive activities. In this regard, a range of measures have been employed either focusing on assets brought to marriage (Quisumbing and de la Bierre, 2000), current assets (Quisumbing and Maluccio, 2003; Doss, 2006) or assets on divorce (Fafchamps et al 2009). In terms of what assets are good measures of bargaining power, most studies use a range of assets key among which are land, livestock, and real estate, or any assets, which are of significant value to the society in question.

The use of asset ownership as a measure of bargaining power however has its limitations. In the first place, the use of current assets, which might also be the outcome

of bargaining between spouses, could confound the causal effects of bargaining power. To avoid this, some researchers such as Quisumbing and Mallucio (2003) recommend the use of assets brought to marriage instead. However, in some traditional societies women are not allowed to own productive assets such as land or livestock. This implies that any assets she brings into the marriage are in her husband's name and may not count much towards her bargaining power as it would in communities where women's productive asset ownership and control is recognized. In that respect, Fafchamps et al (2009) instead use assets on divorce as a measure of bargaining power. However, assets expected on divorce may be correlated with past or present household behaviour or with other household choices, which could confound the effects of women's bargaining power.

One further limitation researchers are often confronted with in the use of asset ownership for as a measure of bargaining power, is the limited-availability of data. In most surveys, asset data is collected at the household, rather than the individual level. Very few household surveys collect detailed information on individual ownership of assets at the household level which allow for the meaningful measurement of relative asset ownership between spouses, a situation highlighted by Doss (2006). In the limited studies where this is used, the data has been collected specifically for the purposes of that study and not often on a large scale. (See Quisumbing and Mallucio 2003, and Fafchamps et al, 2009,). Lately, more efforts are being made to collect asset level data at the individual level in nationally representative surveys. While the range of assets used are limited in most surveys, where the opportunity exists, it is possible to compute measures of a woman's individual ownership of a range of assets, relative to her spouse. This is a situation exploited in this study with the availability of a range of individually

owned assets and their corresponding values, for the analysis of the links between bargaining power and child educational achievement in chapter 5.

Changes arising from natural and randomized experiments

In addition to policy changes, institutional changes or changes in family law which increase women's bargaining power within the household provide opportunity to observe changes in bargaining power. When legal or institutional changes take place which favour a group of women, it serves as a natural experiment and provides opportunity to use difference-in-difference methods to estimate the effects of the change in the group affected by the change, compared with the group which was not affected. For example, in a study of how changes in marriage law in Brazil affected women and children's welfare outcomes, Rangel (2006) found that in households headed by cohabiting couples, the extension of alimony rights to couples resulted in reduced hours worked by women and increased investments in the education of older girls, compared with households which were not affected by the change in law. Similarly, in a study using data from two Indian states, Deininger et al. (2010) find that changes in inheritance laws to favour girls' inheritance of land led to increased schooling among girls⁹.

However, such natural experiments are rare, and when they take place in developing countries it is even more uncommon to find good quality data spanning the periods before and after the change for analysis. Depending on the study objectives, field experiments such as Ashraf (2009) used in a Bangladeshi study, may be used instead.

However, such experiments are often limited in scope and not nationally representative

⁹ Similar approaches were used by Lundberg Pollak and Wales (1997) and Duflo (2003) with respect to changes in policy resulting in exogenous income transfers to women.

as household survey data may be. One such exceptional opportunity is presented by large scale conditional cash transfer programmes which provide nationally representative data for analysis. For example, several studies have exploited data obtained from randomized control trials conducted in Mexico's PROGRESA (and later, OPORTUNIDADES and PROSPERA) programmes for the analysis of household studies (Behrman and Hoddinott, 2005; Bobonis, 2009; Barham, 2011). However, for most countries, such data does not exist, thus we turn to the more recent measures available in household surveys.

2.3.2 Direct measures

The recent availability of nationally representative household data on powered relations between partners and the measurement challenges outlined above make a case for the use of measures of bargaining power which directly capture household power relations or control over the decision-making process between spouses (Friedberg and Webb, 2006; Dito, 2011, Lépine and Strobl, 2013). Typically, these measures are based on responses to questions regarding decision-making in the household, the experience of abuse from an intimate partner or the perceptions respondents hold about gender violence

Women's involvement in household decision-making is one such direct household-level measure of women's bargaining power (Doss, 2013). Recent household surveys such as the DHS have begun to include questions about how a range of household decisions are made. The responses to these questions provide insights into the bargaining process and resource allocation within the household. The questions are structured to cover decisions

about women's individual access to and control over resources, women's autonomy, health and fertility.

In surveys, the typical approach is to specify a decision and ask if the respondent makes it alone, with her spouse, her spouse makes it alone, or someone else does. Using this approach, the Demographic and Health Surveys for example, collect data on women's involvement in decisions regarding how to spend the incomes of each spouse, decisions on large and daily purchases, decisions about freedom of choice when it comes to her fertility, health and freedom of association such as visits to her family. From the responses obtained, an index of bargaining power is computed based on a method of choice by the researcher.

Jensen and Oster, (2009) for example use a subjective index, from responses to six questions to which they assigned a code of 1 if a woman indicates that she is solely or jointly involved in making the final decision in that domain and zero if she is not. For their measure of bargaining power, they then use the average of the six responses to generate an index. This approach is quite subjective since it does not consider the relative contribution of each decision to a woman's bargaining power. However, decisions involving daily purchases may not carry the same weight as decisions regarding large purchases such as land, houses, or goods that are more durable. Therefore, assigning equal weights to both decisions could potentially introduce measurement errors in intra-household bargaining power. In this regard, an alternative approach is to use principal component analysis (Lépine and Strob, 2013)¹⁰.

¹⁰ Some studies may rely on only one decision-making question to measure dimensions of bargaining power of interest. For example, researchers interested in health seeking behaviour may use the

Another approach for measuring women's bargaining power is to use women's perceptions, or their experience of domestic violence. A woman's experience of domestic abuse - economic, physical, psychological or emotional - is dis-empowering and is potentially related to household welfare in direct and indirect ways. First, the harm a woman experiences from domestic violence may limit her ability to exercise choices in her or her children's interests. Apart from the physical and emotional harm it may cause, domestic abuse lowers a woman's self-esteem and ability to participate in household decision-making as an equal which implies that her preferences are less likely to be reflected in the allocation of household resources.

Information on gender based domestic violence is increasingly becoming available in large household surveys. The DHS for example, collects data on women's experience of physical, sexual and emotional violence as well as women's perceptions of violence. However, the major drawback in the use of a woman's experience of violence as a measure of bargaining power is the credibility of responses given and the reliability of the data obtained. Due to the fear of stigmatization, most women under-report their experience of domestic violence. In that regard, the two possible ways around the situation is to ensure that high quality standards of confidentiality are used in the collection of data, or resort to the use of indicators of domestic violence based on women's perceptions rather than their experience of it. In chapter four, due to the potential under-reporting, we first analyze descriptively, the domestic violence data with the view to establish possible measurement errors. Where these are suspected to

responses to the question "who takes the final decision about taking the child to the hospital when they are ill?"

occur, we proceed to indicate so and expect that the results from the regression analysis will be interpreted accordingly.

To conclude, most studies on the intra- household allocation of resources, resort to the use of indirect measures of bargaining power primarily due to data limitations and the fact that bargaining is not easily observed. The key challenges associated with interpreting the results from the use of such measures have been discussed while arguments have been advanced for the use of what are considered more individual level or direct measures of women's intra-household bargaining power. In the absence of data from randomised trials or natural experiments and with the increasing availability of data from large, high quality household surveys which also include modules on household power relations, it is possible to construct measures of bargaining power for the analysis of its links with children's welfare. This is the basis for the bargaining measures selected for the analysis of the three core chapters of this thesis. We next review the links between child welfare outcomes and women's intra-household bargaining power.

2.4. Linking child welfare outcomes with intra-household bargaining power

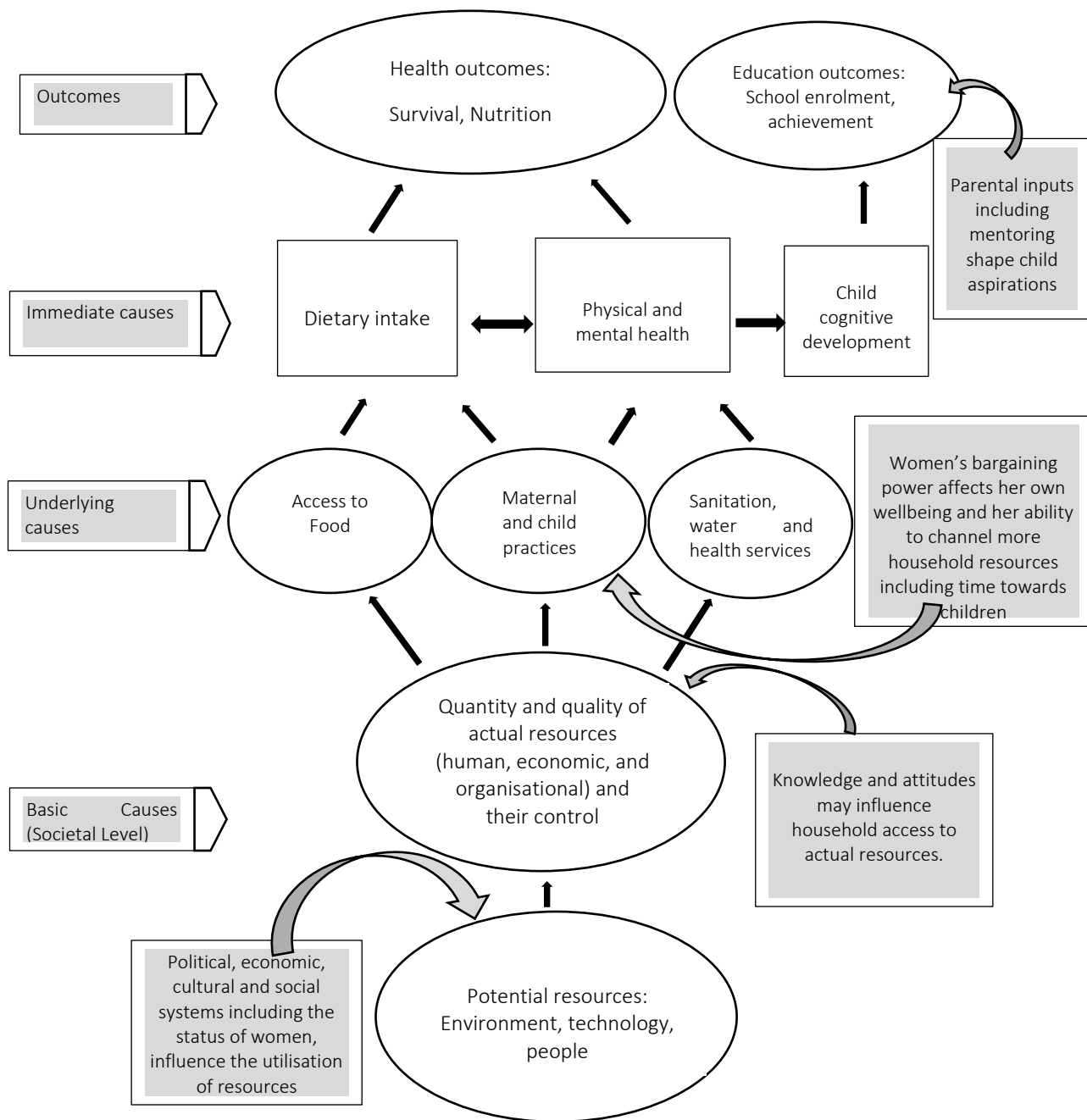
From the literature, the most common approach on modelling child welfare in relation to intra-household bargaining power has been to think of child welfare outcomes as a function of different layers of factors including individual, household and societal factors. Mothers bargaining power is exercised at the level of the household, among other maternal factors. We review the conceptual frameworks along with empirical

studies based on these frameworks linking child welfare outcomes to women's bargaining power, with a view to understanding the transmission mechanisms. The section concludes with a discussion on the measures of child welfare outcomes adopted in this study.

The UNICEF (1998) framework is one such example. Even though the framework is limited to discussing the possible mechanisms of transmission between child health outcomes and their determinants, it is useful in providing an understanding of the role played by women in child welfare outcomes in general including educational outcomes. An adaptation of the framework is presented in Figure 2.1.

To begin with, child health outcomes are shown to be influenced by proximate and underlying socio-economic factors (Mosley and Chen, 1984). Proximate factors being those mechanisms or factors that are directly related to the individual child such as their dietary intake and disease. These immediate factors are in turn influenced by household, and community level socio-economic factors including the household's access to food, good water, sanitation and health services as well as maternal and child practices, while household level factors are in turn influenced by a variety of societal level factors including the societal norms and practices that have a bearing on the status of women. Within this framework, the household is the level at which women's intra-household bargaining power features.

Figure 2.1 : The links between child welfare outcomes and women's bargaining power



Source: Adapted and modified from UNICEF, 1998

It matters in the negotiation and channelling of resources at the household level towards dietary intake, childcare practices and access to health services, good sanitation and water. What this framework thus suggest is that a woman's bargaining power is one of the many determinants of child welfare. On that basis, one approach which has been used in empirical studies has been to model children's welfare outcomes as a function of their determinants while incorporating a measure of women's relative bargaining power into the model and ensuring that all other maternal and household factors are controlled for. This is the approach used by Fafchamps et al (2009), Dito, (2011), and Schmidt, (2012), among others. With this approach, potential challenges arise with identifying the effects of women's bargaining power which if not addressed, implies that the estimated results can at best be interpreted as associations between child outcomes and women's bargaining power.

Other researchers are of the view that the links between children's welfare outcomes and their mothers relative bargaining power in the household, may be more complex (Dávalos and Santos, 2006; Yount et al, 2011, Richards et al, 2013). They identify at least two key pathways linking children's welfare outcomes to women's relative bargaining power – the direct and indirect pathways. First, a woman's intra-household bargaining power may dictate the extent to which she can influence the channelling of household resources into inputs, which directly enhance child welfare outcomes such as food inputs, or the access to health services. Second, due to the primary role played by women as caregivers, a woman's own wellbeing is crucial to child health as it dictates the quality of care and attention she can give to her children. This suggests that the effects of a woman's bargaining power on child welfare may be mediated by her ability

to allocate household resources for her own wellbeing so that she is in a good physical and mental state to care for and make adequate choices about her children's welfare.

To illustrate these pathways, we use the framework by Richards et al (2013), which aims to show the cyclical effects of a woman's (lack of) bargaining power on child welfare. An adapted version is presented in Figure 2.3. Drawing from studies of diverse low and middle-income countries, Richards et al (2013) arrive at this framework from a review of the influences of intra-household bargaining power on child survival with a focus on health and nutrition outcomes. Their review suggests that women's bargaining power within the household is reflected in their decision-making power and their access to and control over household resources. Household resources are distributed unevenly when women do not have access to and control over them, which coupled with a lack of decision-making power, limits the ability of women to access services for themselves and for their children.

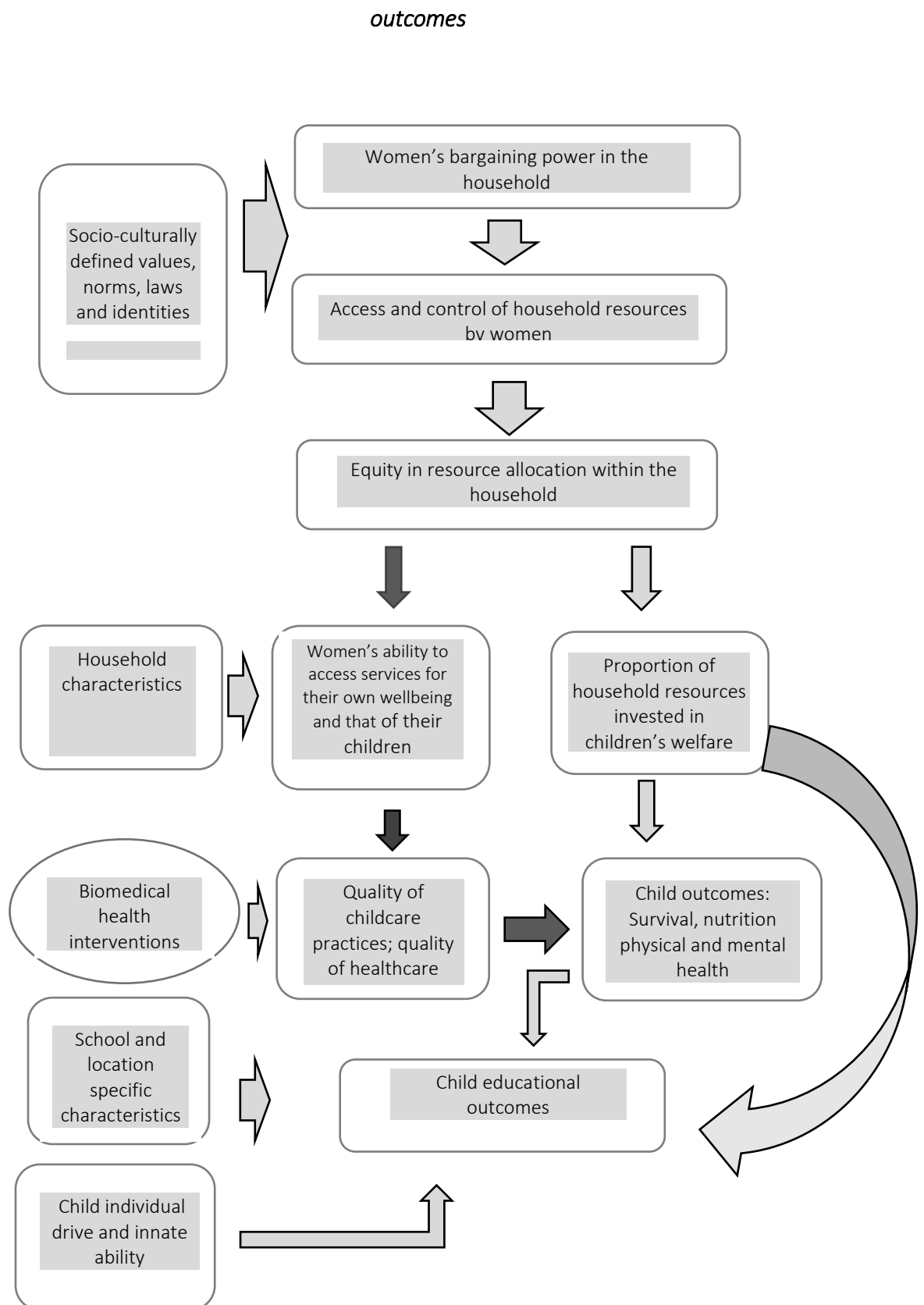
When women are not physically and mentally healthy or if they are not adequately nourished, it compromises on the quality of care they can give to their young children. These are depicted in figure 2.2 by the darker shaded arrows. In addition, their limited control over household resources limits the allocation of household resources into the nutritional and health inputs necessary for enhancing children's wellbeing. For example, critical inputs such as feeding practices, accessing adequate medical care before, during and after the birth of the child and immunisation, all of which are necessary for the child's health and survival, may be adversely affected by a woman's lack of bargaining power.

A number of studies have demonstrated the important associations between women's bargaining power and their own nutrition as well as that of their children (Smith et al., 2003; Fafchamps, Kebede, and Quisumbing, 2009; Bhagowalia et al., 2012). For example, Bhagowalia et al. (2012) find positive associations between greater dietary diversity scores and Bangladeshi women's bargaining power (measured by attitudes toward abuse, decision-making power, and mobility). They also find similar associations between reduced child stunting and women's bargaining power in that same study.

Also, in the analysis of Ethiopian data, Fafchamps, Kebede, and Quisumbing (2009) found positive effects of female bargaining power on women's nutrition as well as child nutrition and child education. Their study measured women's bargaining power as land and livestock brought to marriage, expected land and livestock upon divorce, involvement in household purchases, and whether the wife had non-farm income. In addition, two proxies of predisposition toward violence and cognitive ability were included in the study. However, in their study did not explore how these effects of bargaining power might be mediated by other maternal factors.

On the other hand, however, Bhagowalia et al. (2012) have shown that women who lack bargaining power, have lower mental health, lower self-esteem, limited control over resources within the household and limited ability to access information about health services for the benefit of herself or her children. Bhagowalia et al. (2012) too do not go on to examine how women's wellbeing may mediate the effects of intra-household bargaining power on the welfare outcomes of children.

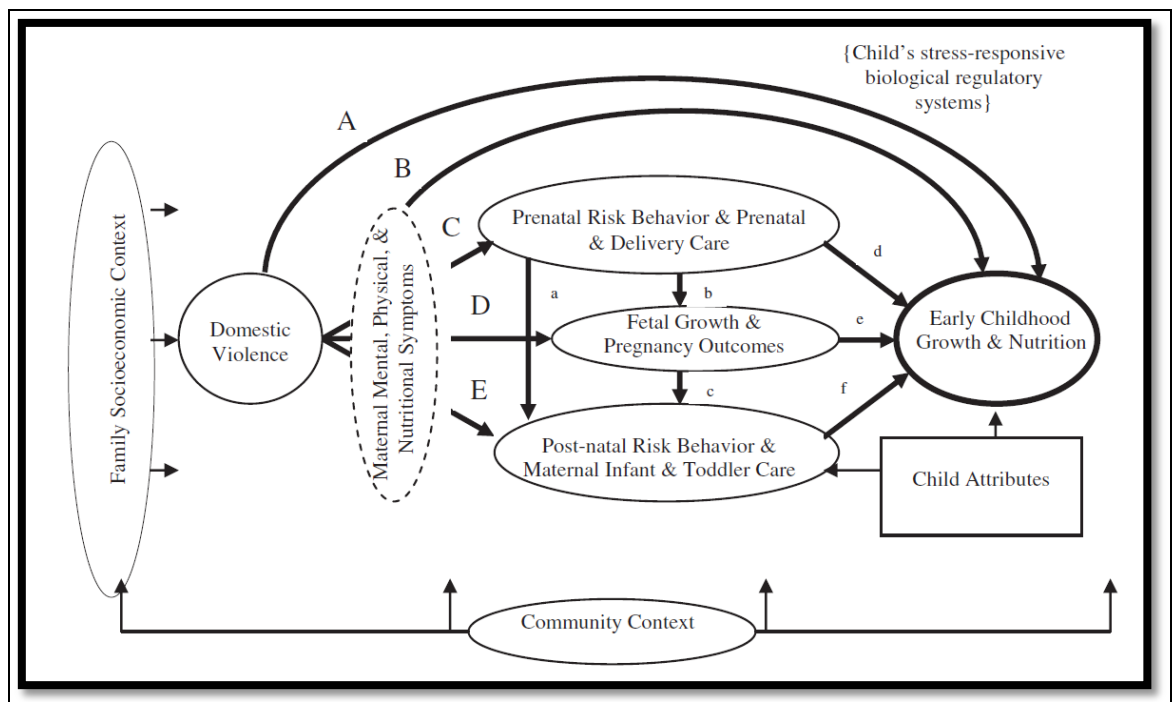
Figure 2.2: The transmission mechanisms of women's bargaining power on child welfare



Source: Adapted from Richards et al (2013)

The framework proposed by Richards et al (2013) however, suggests that the effects of a mother's bargaining power on child welfare may be transmitted indirectly through maternal wellbeing. One example of a clear depiction of these pathways of transmission is the framework by Yount et al (2011) in figure 2.3, which highlights the possible ways in which the experience of domestic violence by the mother may impact children's survival both directly and indirectly through the mother.

Figure 2.3: Mediating factors: an example of the domestic violence –child survival framework



Source: K.M. Yount et al. (2011) Social Science & Medicine 72 p 1531

The review by Yount et al (2011) focuses on the effects of domestic violence against women- an indicator of ultimate disempowerment-on child welfare. They show several

pathways through which the impacts of mothers' experience of violence on child welfare may be

mediated. The proposed framework identifies five pathways (lettered A to E) through which the mother's experience of domestic violence can affect growth and nutrition before, during or after the birth of a child. Four out of five of these pathways are mediated by maternal nutrition, mental and physical health.

Their framework highlights the importance of a woman's own wellbeing as a mediating factor. The diagram shows that after delivery, several indirect pathways (B to E) link a mother's experience of domestic violence to the child's growth and nutrition via the mother's own mental and physical wellbeing. For example, when a woman is a victim of violence, one probable effect is her inhibited psychological wellbeing, which may manifest itself as depression or anxiety. Her physical wellbeing could also be affected through bodily harm, fatigue or disability or inadequate nutrition resulting in anaemia or poor weight (pathway B) all of which limit her capacity to provide adequate attention and care for her child. Further, the experience of violence for some mother's result in risky behavioural choices such as smoking, alcohol and drug use which are harmful to her and her child (pathway C). Given that mothers are the primary caregivers of young children, these can have adverse effects on children and slow down early child growth or cause malnutrition.

Risky behaviour, for example, may lead to impaired judgement reflected in unsatisfactory choices in prenatal and delivery care. Such choices, in addition to poor mental and physical wellbeing of the mother, may result in inadequate foetal growth and pregnancy outcomes (pathway D) such as low birth weight. After delivery, her

impaired judgement may reflect in poor choices (pathway E) related to maternal and childcare manifested as sub-standard feeding practices, exposure to infection and inadequate psychosocial care.

It is also worth noting that the effects of these pathways may vary or be influenced by child, household and community factors such as the child's age, gender, genetic predispositions maternal autonomy and obstetric history as well as household socioeconomic status (Yount et al, 2011).

From the empirical literature, several studies have drawn on aspects of this framework in examining how women's experience of violence have affected child welfare outcomes. For example, Asling-Monemi et al. (2003) find using data from Nicaragua, that sexual and/or physical domestic violence are positively associated with the increased risk of infant and child mortality, negative caregiving behaviours and practices as well as maternal stress. However while they acknowledge in their conclusions that "..... violence may impact child health through maternal stress or care-giving behaviours rather than through direct trauma itself" (Asling-Monemi et al., 2003), they do not explore how child health is impacted by the maternal factors mentioned.

Dávalos and Santos (2006) on the other hand explore the indirect effects of a woman's experience of domestic violence on child nutritional outcomes using DHS data from three Latin American countries. They find that a woman's experience of violence has adverse effects on a child's long term nutritional status but also find that this is mediated by the mother's demand for health inputs. Specifically, her experience of domestic violence was positively associated with reduced probabilities of patronising adequate antenatal care, immunising the child and breastfeeding. Other studies, which

have also used the DHS data, however do not explore the potential indirect links between women's experience of violence and child health and nutrition.

In sum, we have reviewed the empirical evidence on the analysis of the effects of a mother's intra-household bargaining power on child welfare outcomes. While most studies view the effects as direct more recent studies show that researchers are beginning to explore the indirect pathways some of which have been highlighted in the preceding discussion. Although the direct approach could potentially under-estimate the effects of women's bargaining power on child welfare, data limitations may also sometimes pose a challenge to exploring indirect effects. Given the challenges in finding appropriate data needed to adequately measure maternal bargaining power and child welfare, the decision to explore the direct and indirect effects is subject to the nature of the data available to the researcher. Next we discuss the measures of child welfare used in this thesis.

2.5 Measures of child welfare outcomes

With the increasing recognition of the importance of investments into children's welfare as a strategy for sustainable development, children's health and education has gained growing attention. While the social dimensions of their wellbeing are also important, we provide a justification of our focus in chapter 1. Our key reasons being the importance of early childhood health and child education for children's lifetime productivity (Smith et al, 2011) and their significance in *".....the intergenerational transmission of poverty and potential for upward mobility across generations."* (Doss, 2013).

Several indicators of child health have been studied in the bio-medical and socio-economic literature among which are mortality, morbidity and nutrition. Mosley and Chen (1984) make useful suggestions on the computation of useful indicators of child health and survival which combine measures of mortality with growth faltering and disease. However, due to data limitation and for the comparability of our results with other studies, we focus on three aspects of children's welfare – two of which are crucial for child survival - nutrition of children under the age of five and infant mortality, and educational achievement.¹¹

Nutrition

To measure children's nutritional outcomes, we adopt one of the common conventions in the nutrition literature, which assesses children's nutritional status using indicators constructed from anthropometric measures. Typically for children under the age of five, anthropometric measures, based on physical body measurements of height or weight in relation to age and sex provide a useful indication of how adequate their growth and nutritional intake is. A range of methods are used for constructing indicators which express comparisons between the individual of interest and a reference group. When *percentiles* are used, the rank position of an individual on a given reference distribution is measured in terms of what percentage of the group the individual exceeds or is equal to. Another approach is the *percent of median*, which calculates the ratio of the individual's measured value to the median value of the same sex and age (or height) from the reference group.

¹¹ For a justification of the focus on the selected child outcomes, see chapter 1.

Apart from children's age and gender, their weights and heights may depend on genetic variation among other factors. For this reason, the indicators are computed in relation to a "healthy" reference group. Most researchers on nutrition (including the WHO) however tend to use *z-scores* (also referred to as *standard deviation scores*). These are calculated as deviations of an individual's value from the median value of the reference group (for the same sex and age or height) expressed as a ratio of the standard deviation of the reference group.

Researchers use a variety of measures of nutrition such as the Mid Upper Arm Circumference, (Lépine and Strobl, 2013) or iron and vitamin levels. The measures used in this thesis are however based on the WHO (2006) reference group, a group of children from a range of ethnic backgrounds and cultural settings, with mothers who engaged in what are considered health-promoting practices such as breastfeeding and not smoking. Also, based on this reference group of healthy children from different parts of the world, the WHO has also issued growth standards for children from birth to the age of 5 for the determination and classification of different forms of malnutrition. The relative ease of collecting information regarding height and weight in surveys¹², makes it pragmatic to compute measures of *height-for-age* (HFA), *weight-for-age* (WFA) and *weight-for-height* (WFH) based on WHO (2006) and also interpret the z-score obtained.

Height-for-age is a measure of cumulative linear growth. Past chronic inadequate nutrition or illness are reflected as lower than normal HFA or "shortness". The z-score of (HFA) therefore provides an indication of the effects of long-term nutrition. "Stunting"

¹² Compared with measures of micro-nutrients and measures of haemoglobin counts.

is the pathological form of shortness. A child is considered stunted if the value of their HFA z-score is more than two standard deviations below the mean and severely stunted if their HFA is more than three standard deviations below the mean. Thus, a z-score lower than -2 implies that the child is stunted or severely stunted if their HFA is less than -3.

Weight-for-height (WFH) measures body weight in relation to height. It gives an indication of the nutritional status of an individual at the time of measurement. The z-score of WFH is a useful measure of short-term changes in nutrition. Low WFH is an indication of “thinness” whereas its pathological form is termed “wasting”. Wasting may be caused by starvation or severe illness such as diarrhoea. Children whose WFH z-scores lie below -2 and -3 standard deviations are considered as wasted and severely wasted respectively.

Weight-for-age (WFA) on the other hand is a measure of body mass in relation to age. It is a composite measure, of HFA and WFH and therefore more difficult to interpret. Low WFA is an indication of “lightness” and z-scores of WFA are used to determine whether a child is pathologically underweight (WFA z-score below -2). It is worth noting that WFA could potentially confound the effects of short and long-term health and nutrition problems.

We do not use measures of micronutrients, since this often involves drawing samples of blood, and are more prone to errors of measurement and omission than is the case with anthropometric measures outlined above. In addition, the collection of children’s anthropometric measures is less expensive and easier and more widely used allowing for greater comparability to previous studies on child nutrition. However, while

convenient to obtain, it is also worth noting that measurements of HFA could be flawed if care is not taken, as the measurements taken while the child is lying down, would give a different z score to those taken while standing. For this reason, adjustments need to be made for measures of height taken while the child is lying down (length). Such adjustments have been made in the DHS data used.

Mortality

The death of any child is a waste of potential human capital resources, yet being able to make it through the first five years of life is crucial to long term survival and quality of life. However, with statistics showing high levels of global child mortality - 5.9 million children deaths before their fifth birthday – further attention needs to be given to studying and monitoring under five mortality globally. A further look at the statistics reveals that about 75% that is three out of every 4 children who died before their fifth birthday, died before they turned one (UNICEF, 2016). We therefore focus on modelling infant mortality which measures the death of a child before they reach their first birthday.

Given that this is a study which focuses on the individual child, we need to clarify how different our measure of infant mortality is from the conventional macroeconomic indicator of infant mortality. Conventionally, for any given population, infant mortality is expressed as the number of deaths of children before they reach their first birthday, for every 1000 live births of children in the same age range. However, this measure of infant mortality is only applicable to analysis carried out at the aggregate level and will not suit the current study.

DHS provides information on the personal, maternal and household characteristics needed for the computation and analysis of child mortality data for children aged up to 59 months by the time of the survey. To measure mortality at the individual level, this study, therefore employs a binary measure of infant mortality which takes on a value of one if a mother indicated at the time of being interviewed that she had lost a child before their first birthday, for all live births which took place between one and five years preceding the survey. We do not include children under the age of one in the samples analysed to avoid errors in measurement of infant mortality. An alternative approach will be to include children born within the year before the survey, and estimate as a hazard model but that will require more accurate measures of the timing of death is highly subject to recall error.

Educational Achievement

The importance of children's education for lifetime income and productivity has been stated in the previous chapter. To start with, it is important for households to enrol their children in school, which for much older children, is an opportunity cost of their time, considering that time spend at school could have been spent on productive activities which contribute to household resources. Going to school also calls for some investments of the household's resources on a child. The payment of school fees is one such investment, and where fees are not required – such as when the education policy is to provide free education to children of a certain age range-, most school-going children still need to be fed, clothed and appropriately resourced with books and equipment needed in relation to attending school.

Apart from the investment of financial resources and children's time, adults in households may also expend their time in activities aimed at supporting children's learning and education such as attending meetings and supporting the child at home with their homework. Therefore, from the point of view of the household, investments in children's education can be in the form of the child's time in the form of enrolment, expenditure on children's education, or even parental time spent to support children's learning. Given this background, and our aim of determining the effects of women's bargaining power on children's educational outcomes, this study seeks a measure which adequately captures the investments made in a child's education at the household level.

Several measures of child educational outcomes have been used in the literature, which may only be measuring some but not all the investments made in a child's education. For example, while in some households, child school enrolment is an indication of the child's time spent at school (and therefore time forgone by the household which that child could have spent engaged in productive activities mean to benefit the household) but no additional investments in fees or other education-related resources. Yet for another household, it may signify more than that – as being enrolled also involves investments of fees, resources and time. Child school enrolment and attendance have however been extensively researched in relation to women's bargaining power¹³ (Schultz, 1996, Glick and Sahn, 2000, Fan and Chen, 2001; Davis-Kean 2005). Nonetheless with the introduction of free compulsory basic education, enrolment rates are near universal for boys and girls, but some of the pertinent issues related to

¹³ Other educational outcomes used in studies are child time use and child labour (Illahi, 2001, Basu, 2006, Dito, 2011).

children's welfare would be their progression through school and what skills they acquire in the process of schooling.

In that respect grade attainment is a better measure of household investments in children's education, but again it needs to be considered within the context of their age hence the use of age related grade attainment (see Psacharopoulos and Yang, 1991) may be a better measure. Age-related grade attainment or schooling-for-age (SAGE) is defined as the total number of years of schooling completed by a child, expressed as a share of the number of years they should have spent in school, given that they are required to start compulsory schooling at a particular age. Yet again, where there are differences in school quality and where households' choices can influence what school a child attends¹⁴, SAGE in itself may not adequately measure fully the investments made in a child's education.

In addition, studies like Doss (2006) focus on the effects of women's bargaining power on the share of the household expenditure spent on children's education. However, using a monetary measure excludes the time resources expended on the child's education. In view of the reasons outline above, this study bases its analysis on educational achievement. The use of achievement is aimed at being able to find a measure of all the investments made in a child's education by the household.

The term 'achievement', refers to the degree of competence or mastery attained by a person in a given area of study. It focuses on measuring skills acquired by children, which are crucial for lifetime productivity. In the education literature, outcomes of tests are widely used to measure educational achievement (Davis-Kean, 2005; Magnuson,

¹⁴ These may be direct investments in the child's school choice such as the payment of fees, or indirect investments such a choice of location of the family home.

2007). For the purposes of the study in chapter 5, we use scores obtained by children in mathematics and English as measures of their achievement. One limitation with the use of these test scores is the fact that it fails to capture the soft skills children may learn from being in school, such as social and communication skills, which are also important for work during adulthood. Second, the use of test scores may be a poor measure of skills for children with learning disabilities related to reading and writing while its causation by bargaining power may be confounded by children's own innate abilities and drive. To address these limitation, we do control for children's innate ability and personal characteristics, details of which are provided in the discussion of the estimation strategy in chapter 5.

2.6 Conclusion

In sum, in this chapter, I have discussed the links between women's intra-household bargaining power and child welfare outcomes. The chapter first establishes the theoretical basis for bargaining in the household with a view to establishing what bargaining power is and the context within which bargaining occurs. This is followed by a review on measuring bargaining power with the aim of providing a justification for the use of direct and individual level measures of bargaining rather than indirect measures in other studies. The chapter then proceeds to review the links between children's welfare outcomes and women's intra-household bargaining power. From the evidence reviewed, it is clear that there are direct and indirect pathways of transmission between women's bargaining power and child welfare, however the literature presents limited empirical evidence of the latter. The chapter highlights implications of choosing each

approach and concludes with a discussion of how child welfare outcomes are measured in this thesis. In the ensuing, core chapters, more details are provided about how the effects of women's bargaining power on child welfare outcomes are estimated based on the framework presented.

3. Intra-Household Decision-Making and Child Nutrition Outcomes: Evidence from Ghana

3.1 Introduction

The literature on intra-household resource allocation points to the existence of inequalities in resource distribution within the household depending on the relative power balance between men and women (see Lundberg, Polack and Wales, 1997; Haddad, 1999). As alluded to in the previous chapter, the evidence suggests that the welfare outcomes of members of the household, including children, may be linked to the preferences and relative bargaining power exercised by men and women in the allocation of household resources. In this regard, several studies have found important links between a woman's relative power in the intra-household resource allocation and children's nutrition outcomes (see Haddad, 1999, Duflo, 2003, Smith et al, 2003, Fafchamps et al, 2009, Dito, 2011).

However, a common challenge with previous studies has been finding an adequate measure of power. Caused in part by the limited availability of data, most of the existing studies use indirect measures of women's intra-household bargaining power (see Doss, 2006 for example). However, the use of indirect measures of women's relative bargaining power presents challenges with the interpretation of the results obtained as impacts of bargaining power (Doss, 2013). Yet, there is a dearth of evidence in the literature on the effects of a woman's bargaining power on child nutrition outcomes, which is based on the use of direct measures of bargaining power and non-polarized measure of women's relative bargaining power.

Where studies use direct measures of bargaining power, the focus has been on a dichotomous measure, which considers whether the woman has higher or less bargaining power relative to her partner (Duflo 2003). What these studies fail to consider is how the different distributions of power between partners might be associated with child welfare and thereby distinguish between equal or balanced bargaining power (from this point referred to as “joint” power) and sole bargaining power either by the man or the woman to the exclusion of the other. To my knowledge, only a few studies (Basu 2006, Dito 2011) explore the welfare effects of balanced bargaining power on child welfare outcomes with none so far addressing its effects on child nutrition.

Yet, with one out of every four (representing 161 million) children worldwide under five years of age undernourished¹⁵ in 2013 (UNICEF/WHO/The World Bank, 2014), child malnutrition remains a major global public health concern, with implications for children’s survival and their cognitive and physical development. The majority of these children live in poorer households in Asia and Sub-Saharan Africa (SSA) with the latter experiencing an increase in its number of under-nourished children (UNICEF/WHO/The World Bank, 2014).

Although the causes of under-nutrition among children have been studied extensively, (UNICEF 1990, Smith, 2003; Smith and Haddad 2015), added insights are required on the influence of women’s relative bargaining power on child nutrition outcomes in SSA. Dito (2011) and Lépine and Strobl (2013) have explored the question for Ethiopia and Senegal respectively, however Sub-Saharan Africa is diverse and therefore additional

¹⁵ Refers to stunting, 15% of children under 5 years are underweight and 8% are wasted. (UNICEF/WHO/The World Bank, 2014)

evidence from other parts of the region will add to the existing understanding of the links between child welfare outcomes and women's bargaining power.

In this regard, this study aims to answer two main questions. Using more direct measures of bargaining power, the study revisits the question of how a woman's bargaining power affects children's nutrition outcomes by seeking answers to the following questions:

a) How does a woman's overall relative decision-making power affect the nutrition outcomes of her children during the first five years of their lives?

b) Considering specific decision-making domains, how does the distribution of bargaining power between parents affect child nutrition outcomes and which domains of decisions matter most?

To answer these questions, the study employs cross-sectional analysis of child nutrition and parental decision-making information collected as part of the Ghana Demographic and Health Survey (GHDHS5) in 2008. This survey data presents a unique opportunity of being able to study the links between direct measures of bargaining power and child nutrition outcomes. Direct measures of bargaining power are obtained from parental responses to questions about their relative influence in various spheres of household decisions while child anthropometric measures are used to measure nutrition outcomes.

The DHS survey data is collected by ICF Macro a company contracted by the USAID that works in partnership with government offices of statistics in collecting rich household level data which provide a wealth of information on women's characteristics and children's health outcomes. The DHS data are increasingly being used for analyses of

this kind. This is due to the quality of data collected over two decades and the level of care taken to improve on that record by training their field staff.

Where sensitive data is collected, enumerators are trained to ensure the privacy of the person being interviewed. Similarly, in the collection of child anthropometric data, care is taken with measurements with supervisors checking on and ensuring that corrections are made on the field while the quality control processes associated with inputting the data is rigorous. With the experience of ICF Macro in conducting similar surveys in other parts of the developing world, the company is able to anticipate the potential challenges associated with data collection and address them. For example, in the collection of child anthropometric data, a distinction is made between measures of height taken while standing and those taken while the child is lying and adjustments made in the computations of z-scores. As indicated in chapter 2, child nutrition outcomes are measured using standard z-scores of anthropometric measures of children under the age of 5 years and computed based on the WHO (2006) reference group.

The key findings from this study are first, while a woman's overall involvement in decision-making in the household is associated with better short-term nutrition outcomes (WFA), there is no such strong or significant effect on long-term nutrition (HFA) of children under five years of age. Specifically, child weight-for-age increases by 0.05 standard deviations for every additional sphere of decision-making in which a woman is involved¹⁶.

¹⁶ Of the seven considered in this study. However, when only four key household decisions are considered -decisions related to spending her income or her partner's and making daily and large purchases . Holding

Second, when specific decisions are considered, children from households in which parents engage in joint decision-making have better nutrition outcomes than children from households in which only one parent has the final say in decisions. For example, decisions on spending the woman's income are most significantly positively associated with children's height-for-age. Specifically, children from households in which the woman alone makes decisions on how to use her income, are 0.25 standard deviations taller than those from households in which the man alone decides. However, children from households in which both parents decide jointly how to spend the woman's income, are 0.33 standard deviations taller than children from households in which the man alone decides. Turning to short-term measures again, while there are no consistent differences between children whose mothers take decisions rather than fathers, we find significant positive associations between joint decision-making and child nutrition outcomes. Children from households where parents report making decisions jointly, are between 0.14 and 0.27 standard deviations heavier than those from households where the men have the final say in a given decision.

These findings support the strand of intra-household bargaining literature, which affirms that, overall women's relative bargaining power is positively associated with their children's nutrition outcomes. Among the more malnourished children, however the results show that a mother's bargaining power is more significantly associated with short, rather than long-term measures of nutrition. Moreover, the analysis further shows that children have better welfare outcomes in households where there is a

all other factors constant, a woman's involvement in one more (out of the four) sphere of decision-making is associated with an increase in the average child's height-for-age of 0.05 standard deviations.

power balance between parents rather than an over-concentration of power in one parent.

The rest of the chapter is structured as follows: In the next section, the literature is reviewed, followed by the discussions on the empirical estimation strategy and the data. Next are the empirical results, while the key findings and conclusions of the study follow in the concluding section.

3. 2. Related Literature

Empirical studies in the intra-household bargaining literature highlight a gendered effect of preferences and resource control on children with children benefiting more when women have increased control relative to men in household allocation of resources (Lundberg, Pollak and Wales, 1997; Haddad, 1999; Duflo, 2003; and Fafchamps et al, 2009).

However, as shown earlier in chapter 2, the concept of bargaining power is complex in the sense that it is multidimensional and difficult to measure because it is not directly observed. This has remained a challenge resulting in limited studies on intra-household bargaining and resource allocation across developing countries. (Doss, 2013). Where data availability has permitted, most studies use proxies rather than direct measures of women's bargaining power. The limitation with such measures has been discussed extensively in the previous chapter.

Moreover, these measures tend to focus more on economic power to the neglect of other dimensions of bargaining power such as the social and cultural dimensions which are crucial in defining gender roles and the domains within which men and women

exercise power in the household. Doss (2013) proposes that this use of correlates as indirect measures of bargaining power may be capturing other aspects of women's or household characteristics rather than bargaining power.

In addition, Duflo (2003) points out regarding the use of asset ownership that the presence of assortive matching in the marriage market, may lead to the influences of a household or a partner's characteristics being confounded with a woman's bargaining power and the wrong conclusions made with respect to the causal effects of bargaining power on child welfare.

As men and women could exercise control over different domains as suggested by Lundberg and Pollak (1993) and Browning et al (2006), the impact of bargaining measures on child welfare may differ depending on which domain or sphere is under consideration. Bargaining power is also context-specific, and therefore the use of any measure, which may be biased in capturing economic, socio-cultural norms or legal rules and practices to the neglect of other dimensions, may present biased results on its effects on children's welfare.

The more recent literature advocates the use of more direct measures of bargaining power (Friedberg and Webb, 2006, Doss, 2013). Parental decision –making related to key spheres of household decision-making, provide such a direct measure and allows opportunities to gain further insights into how children's welfare outcomes are related with parental bargaining power (Dito, 2011, Lépine and Strobl, 2013).

Also, most studies limit their analysis to understanding how higher bargaining power on the part of women relative to men are associated with children's nutrition, but do not investigate how balanced power may be related with children's nutrition outcomes. Yet

studies by Basu (2006), Gitter and Barham (2008) and Dito (2011) related to schooling and child labour, suggest that balanced household bargaining power, rather than sole power, is more welfare enhancing. It will therefore be useful to establish further understanding of how children's nutrition outcomes may be affected by balanced bargaining power.

3.3. Data and Methodology

3.3.1 The Data Source

The study uses data from the fifth round of the Ghana Demographic and Health Survey (DHS5) collected between September and November 2008. The Demographic Health Surveys are nationally representative household surveys funded primarily by the USAID and conducted by ICF Macro in conjunction with government agencies in developing countries. The survey collects health and demographic data as well as information on other key socioeconomic measures relevant to households and individuals surveyed.

In the fifth round of the Ghana Demographic and Health Survey (GDHS5), 11, 778 households were interviewed. The survey included administering a household level questionnaire to all households sampled while all eligible women aged 15-49 years and eligible men aged 15-59 years were selected to answer the women's and men's questionnaires respectively in 50 percent of the households surveyed. This provided additional information on men and women beyond what was available from the household questionnaire for 4, 916 women and 4, 568 men from 6,141 households. Of these men and women, there are 1,884 couples, who are of interest to this study since

the information on bargaining power is defined within the context of power relations in the household where both spouses are present.

Also, as part of the woman's interview, health and nutrition information was collected for all children in the household who were born in the five years preceding the survey. This included anthropometric measurements taken for all children in the household who were 59 months old or less. Thus, the DHS data presents opportunity to study the links between child nutrition outcomes and parents' decision-making power, while controlling for parent and household characteristics as well as their own individual characteristics.

Questions have often been raised about the quality of data collected from developing countries, and therefore how suitable the DHS data is for the analysis in this study. In Ghana, the Demographic and Health Survey data has been collected every five years beginning from 1988 by the Ghana Statistical Service with the financial and technical support of the USAID and ICF Macro respectively. Apart from the technical competence and credibility of ICF Macro in the collection of household survey data due to its involvement in conducting the DHS surveys in developing countries all around the world, great care is taken in training enumerators and putting quality control measures in place during the survey.

In relation to the collection of sensitive data for example, enumerators are trained to ensure that such questions are only asked after the respondent is assured of their privacy and confidentiality. Field supervisors are also involved in the review of the responses to the questionnaire while the enumerators are still on the field, to enable

them return and clarify any entries which may not be clear. This way errors are minimized.

The collection of child anthropometric data is also very susceptible to errors in measurement. For example, the measurement of a child's height while standing is different from their length while lying down and potentially yield different measures of nutrition outcomes. Again, the DHS surveys require the enumerator to specify which measurement was taken as part of the data collection process. This is then taken into account in the generation of the nutrition measures with adjustments made accordingly.

In general, several studies have used DHS survey data in the analysis of child and women's health outcomes, the results of which are often presented on the DHS websites along with reports of each survey. Feedback from users is encouraged and the methods and modules of the survey reviewed from time to time as deemed necessary with country-specific adjustments also made where required.

The module on women's empowerment which captures information on household power relations and decision-making are later additions to what used to be a survey which focused on household demography and health. With very few existing detailed data on women's relative bargaining the DHS surveys are therefore regarded with high credibility for the analysis of child health and household behavior.

3.3.2 The sample

The study is based on a sample obtained by selecting children with plausible anthropometric data for whom couples' decision-making information is available. Thus

of 2,992 children reported to have been born in the 59 months preceding the interview, 280 children from single parent households were excluded leaving 2,712 children born to partnered women. This is because single women were not interviewed about decision-making thus, one is faced with two possible ways of carrying out the analysis for the impact of decision-making with children born to single women. The first possibility is to include them in the analysis and consider single women as the sole decision maker in all domains or to interact being single with decision-making, allowing a larger sample to analyze the determinants of nutrition, but limiting the impact of bargaining power on nutrition to children born to partnered women. While the latter approach was considered and used in earlier stages of the analysis, anecdotal evidence from Ghana suggests that the extended family plays an important role in the life of a child even when their parents are single and there are likely to be other adults involved in decisions made by the single parent. Since this study uses the relative decision-making power of the parents, it is not possible to obtain an accurate measure of relative decision-making power for single parents within this context. Single headed households were therefore dropped leaving only households in which both parents are present. This approach also makes the results of the study more comparable with previous studies who focus on two headed households, such as Fafchamps et al (2009), Dito (2011), Schmidt (2011), and Lépine and Strobl (2013).

The sample is further reduced by 183 (6.7 percent) to account for children who had died before the survey and for whom, therefore, no anthropometric data was available. In addition, of the remaining children, anthropometric measures for 85 children were missing while measurements for 140 children were outside the plausible range of z-

scores¹⁷. A further 133 records were coded 999, which implies that the information was either not available or not plausible. Where possible, I use the original data to generate the z-scores and if not I treat all of these as missing variables, leaving 2,171 (86 percent) of living children with valid anthropometric measures linked to a couple. However, of these 17 children are further excluded from the sample due to missing parent characteristics. One of the seventeen was excluded because it was the only child in the sample not living with their biological mother. This left a final sample of 2,154 children representing 85.2 percent of children aged between 0 and 59 months who are alive and linked with a partnered woman, for whom plausible and valid height and weight data are available.

The loss of observations could potentially bias the results obtained for the estimated coefficients due to selectivity of the resulting sample. A comparison between the characteristics of this and the original child sample shows little significant differences in child and household characteristics ruling out possible concerns regarding selectivity of this sample of children for the ensuing analysis.

Sample characteristics:

Table 3. 1 shows the child, parental, household and location characteristics of the sample. It has an almost even distribution of boys and girls (51 percent boys and 49 percent girls). The average age in months is 29.17 with a uniform distribution ranging between 18 percent and 21 percent for each age cohort in year. The average birth order is about 3.4, although the reported birth orders ranges between 1 and 14. About

¹⁷ In theory the z-scores can assume values ranging from negative infinity to positive infinity, but only measures of HFA ranging between -6 and 6, WFA between -6 and 5 and WFH ranging between -5 and 5 standard deviations, are considered plausible according to WHO (2006).

20 percent of the children reported to have had diarrhoea in the two weeks preceding the survey while about 31 percent had had a fever or cough over the same period.

On average, mothers of the children sampled are younger (30.5 years compared with 36.9 years) and less educated (4.5 years compared with 6.9 years) than their partners. Men have about two extra years of schooling on average than their partners, and are about six years older. Despite having an average of 4.5 years of schooling, only about 28 percent of the women in the sample are literate. Women's average BMI was 23.1 if the eleven percent of women who reported being pregnant are excluded and 23.5, overall. The average number of children born to each woman was 3.69 with 3.36 surviving.

A large proportion (91 percent) of women in the sample reported that they worked, but the majority (78 percent) of women who worked were self-employed, while ten percent of the remaining one-fifth worked for a family member and twelve percent for someone else.

Married women, who worked for an income, were asked about their earnings relative to their partners' incomes. In all, 15 percent of the women reported that they earned an income that was more than or equal to their partner's, while 57 percent earned less. The remaining women in the sample did not earn at all or could not tell their earnings relative to their partner's.

Table 3. 1 : Summary statistics of child, parental and household characteristics

Variable	Mean	Std. Dev.	Min	Max
Child Characteristics:				
<i>Child's age (months)</i>	29.17	17.21	0	59
<i>Male Child (%)</i>	51	50.00	0	100
<i>Birth order</i>	3.43	2.18	1	14
<i>Recent Diarrhoea (%)</i>	20	40.56	0	100
<i>Recent fever or cough (%)</i>	31	51.41	0	100
Mother's characteristics:				
<i>Mother's Age (years)</i>	30.54	6.86	16	49
<i>Mothers Educ. (years)</i>	4.49	4.44	0	16
<i>Mother's BMI (pregnant excluded)</i>	23.11	4.25	12.18	56.94
<i>Mother's BMI (pregnant included)</i>	23.47	4.27	12.18	56.94
<i>Mother Pregnant (%)</i>	11	30.83	0	100
<i>Woman works (%)</i>	91	28.43	0	100
<i>Woman earns more or equal to partner (%)</i>	15	35.15	0	100
Household Characteristics				
<i>Male hh head (%)</i>	78	40.56	0	100
<i>Household size</i>	5.79	2.70	2	22
<i>Partner Education (years)</i>	6.85	5.34	0	20
<i>Age of Partner (years)</i>	36.93	11.31	0	96
<i>Polygamy (%)</i>	19	40.25	0	100
<i>No of other wives</i>	0.22	52.34	0	5
<i>Wife rank</i>	1.11	39.59	1	5
<i>Dependency ratio (%)</i>	51	17.71	6	88
<i>Richest HH (%)</i>	15	32.80	0	100
<i>Rich HH (%)</i>	19	37.35	0	100
<i>Middle income HH (%)</i>	17	35.80	0	100
<i>Poor HH (%)</i>	22	41.31	0	100
<i>Poorest HH (%)</i>	27	47.40	0	100
<i>Flush toilet (%)</i>	9	25.30	0	100
<i>Clean water (%)</i>	17	34.82	0	100
<i>Christian (%)</i>	68	47.39	0	100
<i>Muslim (%)</i>	19	39.99	0	100
<i>Traditionalist (%)</i>	7	28.23	0	100
<i>Not religious (%)</i>	5	22.57	0	100
Location control variables				
<i>Urban (%)</i>	32	46.81	0	100
<i>North (%)</i>	34	47.32	0	100

Source: Author's calculation from Ghana DHS 5, 2008

The average household size in this sample is six with a dependency ratio of about 51 percent children to adults. 78 percent of the children sampled live in a male-headed household. 19 percent of children live in a polygamous household while on average; the sample seems to have a higher proportion of poorer households with the number of children from households in the lowest two quintiles being about 49 percent. About one-third of the children come from urban located households while 34 percent of children sampled live in one of the three northern regions. About 20 percent of these children are from polygamous households and the rest from monogamous households¹⁸. We next discuss the key variables of interest, child nutrition and bargaining power, followed by descriptive analysis and summary statistics of the variables included in the estimated regression which follow.

3.3.3 Key variables

Women's Intra-household bargaining power

In the analysis of the effects of women's bargaining power on child nutrition two kinds of measures are used. First, a composite index, $BPINDEX_{PCA}$, obtained from principal components analysis of the seven different decisions-making domains or spheres in the household, then a non-composite measure for each sphere of decision-making are employed.

¹⁸ A negligible number (14) of women reported that they did not know whether their partner had other wives apart from themselves. These were included in the monogamous households.

The seven domains are decisions about i) daily purchases, ii) large purchases and iii) spending the woman's income if she earns any, iv) spending the man's income if he earns any, v) the number of children to have, vi) seeking healthcare for the woman and viii) visits to her family.

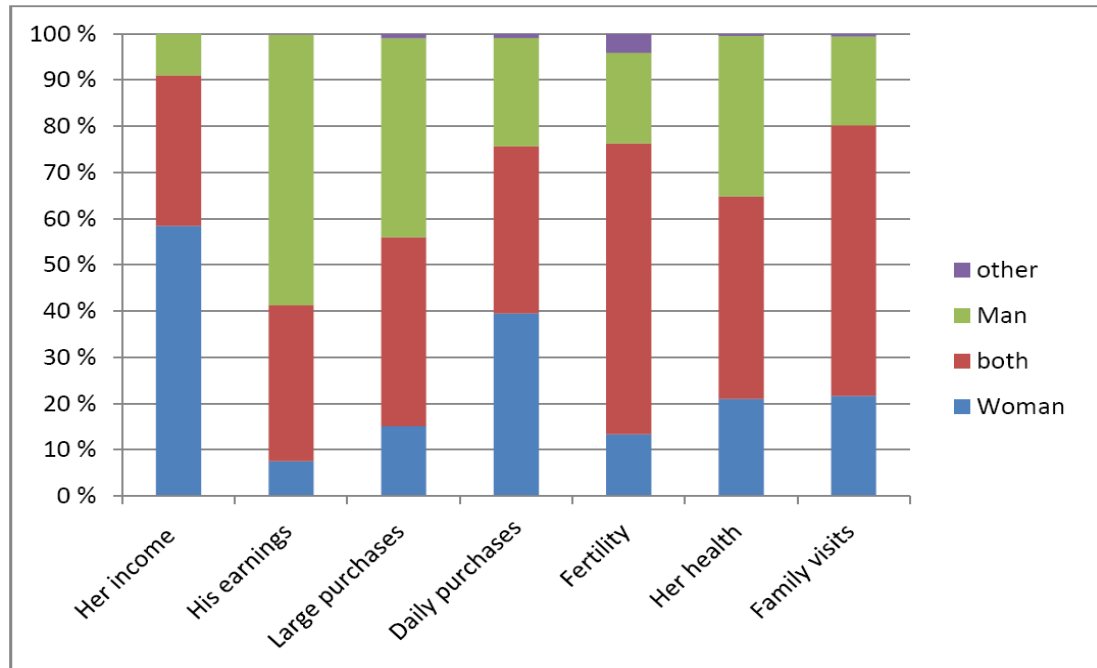
The measures are computed by considering the four possible responses a woman gives to the question:

"Who has the final say on decisions about"

In response respondents may select "Yes" or "No" for each of the four responses "Woman alone", "Both decide", "Husband alone" or "Other person". For each question, a binary variable R_i is defined. Such that $R_i = 1$ if "yes" and 0, otherwise. Thus for each sphere of decision-making, four dummy variables are generated. The stacked bar chart in figure 3.1 below shows how household decisions are made for each question in the sample.

In contrast with the non-composite bargaining power measure, in constructing the bargaining power index no distinction is made between a woman having the final say in the decision in question and both her and her partner deciding together. Thus the bargaining power index provides a composite measure of whether the woman is involved in decision-making treating as equal, a woman's sole decision-making power and joint decision-making power.

Figure 3. 1: Decision-making in households



Source: Author's calculation from Ghana DHS 5, 2008

The index is obtained from binary variables constructed for each decision such that $D_i = 1$, if R_1 (i.e. the woman has the final say) or $R_2 = 1$ (i.e. both have a final say) and $D_i = 0$, otherwise. The binary variables are then used to develop a bargaining power index using principal component analysis (PCA).

This approach is chosen because principal component analysis is useful for reducing data efficiently when there are several variables being used for analysis which are highly correlated as we have with the household decision-making variables. PCA works by first selecting which components are most efficient and thereby deals with the problems of autocorrelation, maximising the variance of the covariates. To begin with I conduct the Kaiser-Meyer-Olkin (KMO) test, to determine whether the use of PCA would be justified for the decision-making data and obtain an overall statistic of 0.69, which is above their recommended benchmark of 0.5 to warrant the use of PCA. Next as shown in Table

A3.1, the components are first generated and their Eigen values reported. Guided by the Kaiser rule which says any component with an Eigen value greater than 1 should be retained, only the first factor would be retained. I however also examine the scatter plots further in making the decision since the Eigen values of the next two components are very close to 1 (i.e. 0.97 and 0.92 respectively). The scatter plots support the conclusions of the Kaiser test since the associations observed are very weak. This can also be confirmed from the loadings obtained when the coefficients are scored as shown in the bottom table of A3.1.

The PCA results presented in Appendix Table A3. 1, show that it's only the first component that is consistently positively associated with the seven decision-making variables although to varying extents. This component is what is termed $BPINDEX_{PCA}$ in the analysis.

As a robustness check, we also construct an unweighted index, $Decisndex_{ALL}$ based on all the seven spheres of decision-making shown in Figure 3.3 (four decisions regarding spending both parent's income and making large and daily purchases). and constructed as shown in equation (3.1).

$$Decisndex = \sum_{i=0}^n Di \quad (3.1)$$

Where n is the number of decisions under consideration and D_i as previously defined.

Table 3.2 shows the proportions of households in which the woman participates in the decision-making either alone or jointly with her partner. The decision-making indices are also presented in the table. Viewed from the point of view of her involvement in decision-making, more than 50 percent of women reported taking part in all household decisions

Table 3. 2: Women's Bargaining power and participation in decision-making

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Household decision sphere:</i>		
<i>Spending his income</i>	41	50
<i>Spending her income</i>	90	46
<i>Visits to her family</i>	80	39
<i>No. of children</i>	76	42
<i>Large purchases</i>	56	49
<i>Daily purchases</i>	75	42
<i>Seeking health care</i>	64	47
<u><i>Constructed bargaining power Indices:</i></u>		
<i>BPINDEX_{PCA}</i>	0.09	1.59
<i>Decisindex_{ALL}</i>	4.75	1.87

Source: Author's calculations from Ghana DHS 5, 2008

except decisions related to spending the man's income in which only 41 percent reported to be involved in. A larger proportion of women are involved in decisions related to spending the woman's income (90 percent), visits to her family (80 percent), followed by fertility (76 percent) and then daily purchases (75 percent). Only 64 percent of women report that they are involved in making decisions related to seeking their own health care while 56 percent take part in decisions related to making large purchases by the household. It is worth noting that

these figures only give an indication of a woman's participation but lumps up her making the decision alone with making it jointly with her partner.

The constructed indices show that on average a woman is generally involved in making decisions in 4.75 out of the seven decision-making spheres.

It is however worth noting that this is at best a crude index and may not necessarily reflect the relative importance of each sphere of decision-making. For example, given that only 15% of women report that they earn more or equal to their partner, what might be more crucial to influencing household member's welfare is who has a say in how the husband's income is spent. Yet this is the sphere in which women report to be least involved in making decisions. While admitting the crudeness of the unweighted index ($Decisindex_{ALL}$), it is useful as a check for the robustness of the results in the estimations of the effects of decision-making on child nutrition.

Child nutrition outcomes:

In chapter 2, I explain extensively how child nutrition measures are generated while noting that malnutrition may take several forms including carbohydrate and protein deficiency, micro nutrient deficiency or even obesity. However, this study focuses on childhood undernutrition due to the high prevalence of undernutrition in sub-Saharan Africa. We use the Conventional¹⁹ z-scores of height-for-age (HFA), weight-for-age (WFA), and weight-for-height (WFH). These are standard measures of nutrition,

¹⁹ Other measures of nutrition include the mid-upper arm circumference (see Lépine and Strobl 2013) or the haemoglobin count as a measure of iron deficiency.

calculated as the number of standard deviations from the median for a selected world reference group of healthy children identified by the WHO in 2006.

Prolonged undernutrition has been associated with stunting or a lower height-for-age, while shorter term undernutrition is associated with wasting – a lower weight-for-height, or being underweight – a lower weight-for-age. It is worth noting that whereas HFA better captures the cumulative effects of child nutrition over the long-term, WFA and WFH, also better capture the short-term changes in nutrition. Although the WFH measure is easier to interpret because it is regarded as a good measure of chronic malnutrition, it is conditioned on child height, and has the tendency to exaggerate the nutrition of shorter children than taller children of the same age. For this reason, this study is more focused on the WFA, which is more conditioned on age and allows for comparison between HFA and WFA.

Table 3. 3 shows the summary statistics of HFA, WFA and WFH. The summary statistics indicate that on average, Ghanaian children are shorter and lighter for their age, relative to the world reference group (WHO, 2006) as shown in Table 3.3. Ghanaian children are also 1.06 standard deviations shorter and 0.83 standard deviations lighter on average than the median of the WHO 2006 world reference group.

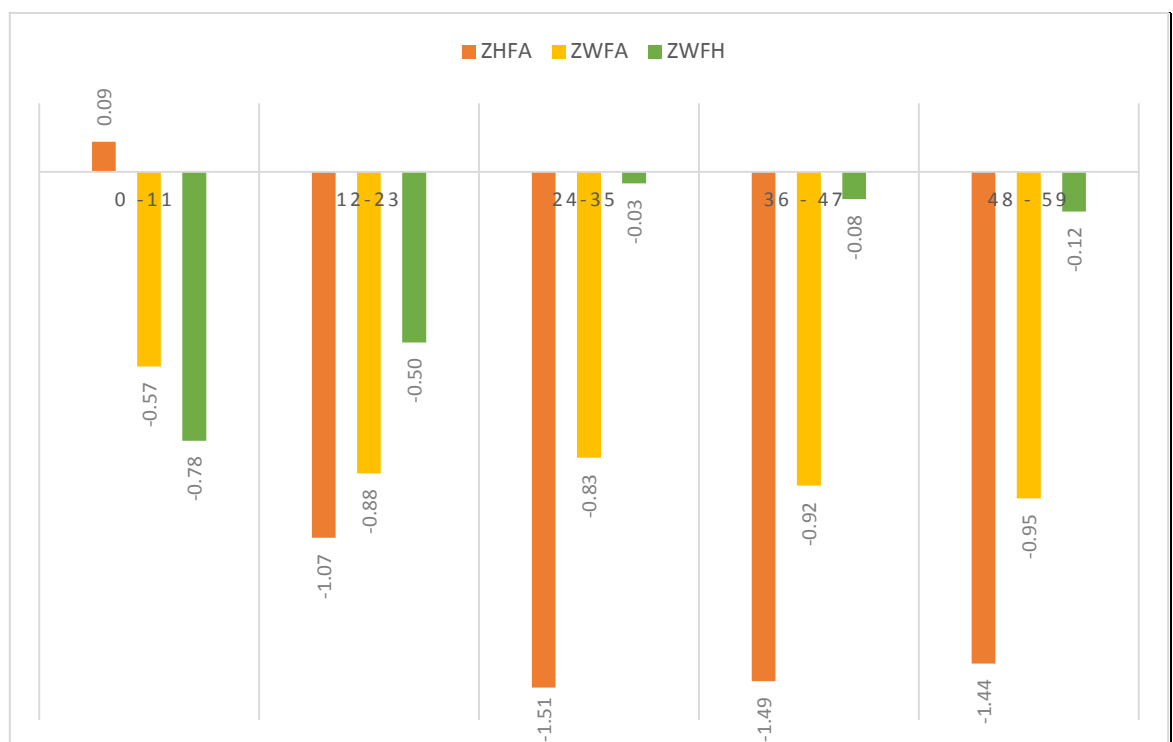
Table 3. 3: Mean child nutrition outcomes by location, wealth quintile, and gender

<i>Variable</i>	<i>All</i>	<i>Location</i>		<i>Wealth Quintile</i>					<i>Gender</i>	
		<i>rural</i>	<i>urban</i>	<i>Poorest</i>	<i>Poorer</i>	<i>middle</i>	<i>richer</i>	<i>richest</i>	<i>Female</i>	<i>male</i>
<i>HFA</i>	-1.06	-1.20	-0.76	-1.31	-1.24	-0.99	-0.83	-0.45	-1.01	-1.11
<i>WFA</i>	-0.83	-0.94	-0.59	-1.07	-0.91	-0.80	-0.61	-0.33	-0.81	-0.85
<i>WFH</i>	-0.32	-0.35	-0.24	-0.45	-0.28	-0.35	-0.19	-0.12	-0.31	-0.32
<i>Percentage :</i>										
<i>Stunted</i>	27	31	19	34	33	25	19	14	26	29
<i>Severely Stunted</i>	10	11	7	13	11	7	7	6	9	11
<i>Wasted</i>	10	10	8	11	10	10	7	6	10	10
<i>Severely Wasted</i>	3	3	2	3	3	3	2	1	3	3
<i>Underweight</i>	15	16	12	19	16	13	10	9	13	16
<i>Severely underweight</i>	3	4	2	4	4	4	2	1	3	3
<i>Overweight</i>	2	1	3	1	1	2	3	3	2	1
<i>N</i>	2,154	1,456	698	734	470	325	361	264	1,064	1,090

Source: Author's calculation from Ghana DHS 5, 2008

Overall, as expected from the literature, we also observe that on average, rural children, have worse nutrition outcomes than urban children, as shown in Table 3. 3. Specifically, children living in rural locations are 0.44 standard deviations shorter for their ages than urban children, and 0.35 standard deviations lighter. They also have lower weights-for-height (by 0.11) than urban children. Again, the data shows that children's nutrition outcomes are better in richer households but worsen with reductions in household wealth.

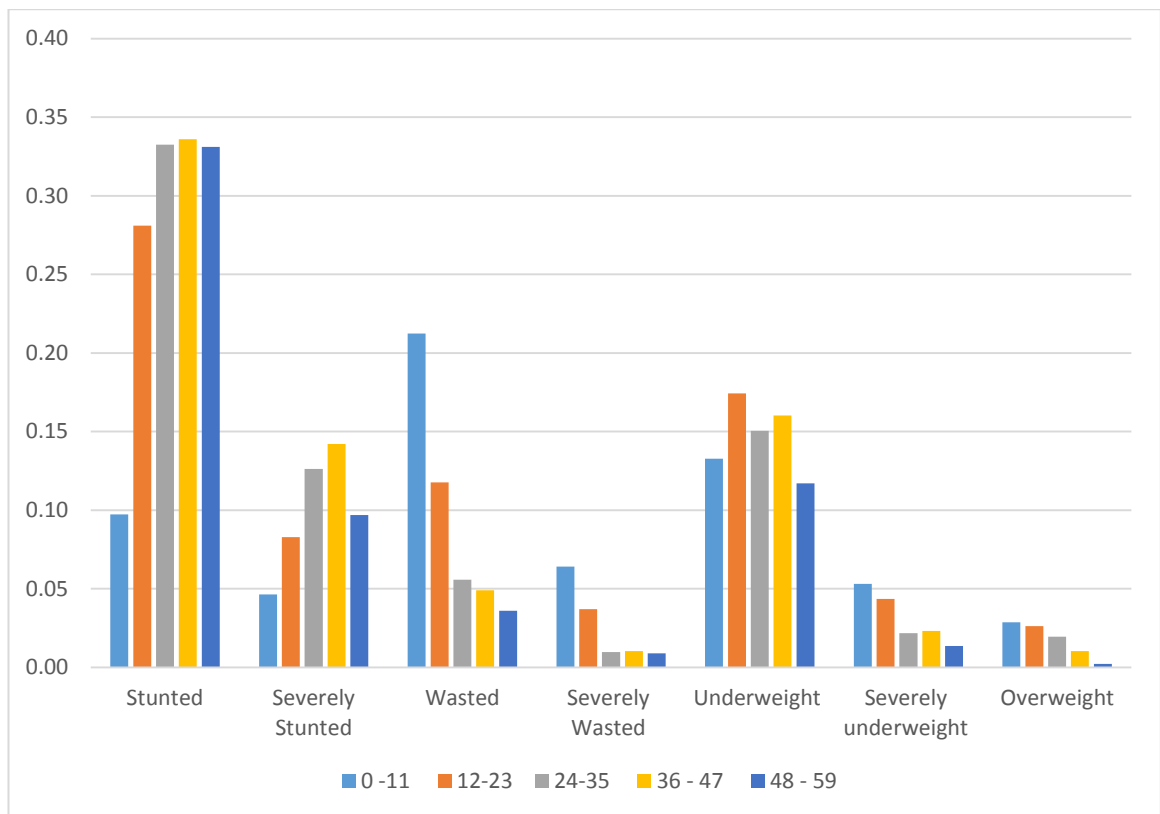
Figure 3. 2: Child nutrition outcomes by age



Source: Author's calculation from Ghana DHS 5, 2008

This is so for all nutrition measures, but most consistently the case for HFA, which shows an average difference of as much as 0.86 standard deviations between the richest and

Figure 3. 3: Proportion of children undernourished by age (months)



Source: Author's calculation from Ghana DHS 5, 2008

poorest households. We also find that girls have slightly better nutrition outcomes than boys, which clearly contrasts with the evidence from southern Asia that suggests that girls are discriminated against in favour of boys. From figure 3.2, when child nutrition is considered by age, one finds that on average, during their first year of life, Ghanaian children have similar, if not better, heights-for-age (specifically, 0.09 standard deviations better HFA) than the median child of the same age in the WHO 2006 reference group. However, there is an

accelerated decline in HFA for children in their second year of life by 0.98 standard deviations with the worst outcomes occurring between 24 and 35 months of age.

Although children aged between 36 and 59 months show slightly improved HFA it leaves the average HFA in a child's fifth year at -1.44, which is still more than a standard deviation worse than the HFA of the median child in the WHO (2006) reference group.

It is highly probable that the relatively better HFA z scores observed before the child's first birthday, may be because most Ghanaian women (about 98% of the sample surveyed) practiced breastfeeding and therefore until they switch to eating solids, children's nutritional needs are provided or supplemented by their mother's breastmilk. Therefore, weaning would be taking place for most children, after their first birthday, which seems to be the onset of worsening HFA outcomes. The worsening HFA seems to suggest that the effects of a mother's influence on nutrition are probably more likely to be evident when children move on to eating solids.

We however find a different pattern for the WFH measure. As children grow older, their WFH z-score improves. It is however worth bearing in mind that since HFA worsens with children's age, this "improvement" which is conditioned on children's heights may not necessarily reflect improved weights, but worsening heights with age. We see this in the WFA measure, which worsens for each age cohort, except between ages 2 and 3 where there is a slight improvement from a z-score of -0.88 to -0.83. We turn our attention next to focus on the malnourished and to do so, we follow the conventional WHO practice which defines malnutrition based on benchmarks of the z-scores, HFA, WFA, and WFH.

From the sample under consideration, it is estimated that overall, about 27 percent of children were stunted at the time of the survey while 15 percent were underweight and

about 10 percent wasted²¹. We also observe similar patterns between malnourishment and location, household wealth, gender and age as observed with the z-score measures of nutrition outcomes. The data (Table 3.3) shows again that a larger proportion of children are stunted or underweight if they live in rural rather urban locations, come from poorer rather than richer households, and to a less extent, if they are male rather than female. Figure 3.3, also confirms that children's long-term nutrition outcomes worsen after their first birthday.

Given that child obesity is increasingly becoming a global health challenge, I also estimate the proportion of children who are overweight for each age cohort and find that being overweight is more a challenge with children in the earlier years, than the latter ones. From about 2.5 percent of children who are overweight, in their first year of life, a negligible proportion of Ghanaian children are overweight by their fifth birthday. However, in comparison to the enormity of the proportion of children who are malnourished, child obesity is not as alarming, even though it will need to be monitored and addressed.

In summary, the data on child nutrition outcomes is consistent with the stylized facts about child nutrition in relation to location and household wealth. We would thus expect these variables to be important when it comes to modeling child nutrition outcomes. We turn next to consider the associations between child nutrition and women's bargaining power.

²¹ The estimates for all children surveyed, are 28% stunted, 15% underweight and 9% wasted respectively and suggests that even if the focus on children living with both parents were to introduce some biases, they are minimal as the data shows that children living with both parents are not necessarily better off as might be feared.

3.3.4 Descriptive analysis of child nutrition outcomes and women's bargaining power

In table 3.4 we present the mean z-scores of HFA, WFA and WFH as well as the proportions of stunted, underweight and wasted children by decision $Decisindex_{ALL}$. The results only show little possible correlation between HFA (or stunting) and the number of decisions a woman is involved in. The only marked difference in child HFA or stunting is between women who not take part in decisions at all and those who do take part in some. However, the mean z-scores of WFA and the proportions of children underweight improve significantly with increased involvement in household decision-making. Similar patterns are observed for WFH and wasting respectively.

As already indicated above, the $Decisindex_{ALL}$ is only a crude measure of bargaining power with every decision given equal weight, thus we proceed to examine the correlations. between the $BPINDEX_{PCA}$ and specific decision-making measure of women's intra-household bargaining power discussed above and child nutrition outcomes. Table 3.4b, shows which measures of bargaining power are correlated with child nutrition outcomes. Again, the data shows that WFA and WFH are correlated with all measures of bargaining power except a woman's involvement in the decision to seek health care for herself. These correlations are statistically significant at a 5% level, even though the coefficients are rather small. When the focus is turned to underweight and wasting however, while her involvement in overall decision making is statistically significantly correlated (again at 5%) with both child nutrition, her involvement in decisions related to daily purchases and visits to her family are no longer associated with being underweight. Similarly, with the exception of a woman's involvement In decisions related to spending the man's income,

Table 3. 4: Summary Statistics showing possible associations between women's bargaining power and child nutrition outcomes

a. Child nutrition by women's involvement in decision

<i>Number of HH</i>	<i>HFA</i>	<i>WFA (Means)</i>	<i>WFH</i>	<i>Stunted</i>	<i>Underweight (Proportions)</i>	<i>Wasted</i>
0	-1.09	-1.17	-0.78	0.26	0.20	0.15
1	-1.50	-1.24	-0.56	0.38	0.25	0.13
2	-1.16	-1.00	-0.47	0.31	0.15	0.09
3	-0.86	-0.76	-0.38	0.23	0.15	0.11
4	-1.08	-0.86	-0.35	0.27	0.14	0.10
5	-1.18	-0.88	-0.29	0.32	0.17	0.09
6	-1.10	-0.80	-0.25	0.29	0.12	0.08
7	-0.80	-0.56	-0.13	0.18	0.09	0.08

b. Pairwise correlations between nutrition and bargaining power

<i>Measure of BP</i>	<i>HFA</i>	<i>WFA</i>	<i>WFH</i>	<i>Stunted</i>	<i>Underweight</i>	<i>Wasted</i>
Decisindex_{All}	0.0490*	0.1185*	0.1019*	-0.0539*	-0.0792*	-0.0493*
BPINDEX_{PCA}	0.0411	0.1061*	0.0943*	-0.0476*	-0.0697*	-0.0441*
Large purchases		0.0672*	0.0598*	-0.0371	-0.0562*	-0.0375
Daily purchases		0.0512*	0.0493*			
Spending his income		0.1094*	0.1022*	-0.0405	-0.0650*	-0.0510*
Spending her	0.0650*	0.0853*	0.0441*	-0.0547*	-0.0732*	
Visits to her family		0.0600*	0.0697*			-0.036
Seeking health care						
No. of children	0.0549*	0.0968*	0.0685*		-0.0648*	

Source: Author's calculations from Ghana DHS 5, 2008

Note: All correlations reported at 10% significance level or better, omitted if above 10%* implies 5% significance level.

which is significantly (at 5%) associated with wasting, her involvement in decisions related to large purchases, and visits to her family are marginally associated with wasting at a 10% significance level while the rest do not show any statistically significant associations.

These summary statistics suggest a potential overall effect of bargaining power on child nutrition outcomes, but also suggest that the effects may be small, may differ by measure of nutrition outcome, and by decision-making sphere. Next is a discussion of the empirical model after which the estimated results are presented.

3.3.5 The empirical model

As indicated in chapter 2, this study adopts the UNICEF (1998) framework to model child nutrition. Following the approach used by Schmidt (2012) Fafchamps et al, (2009) and Lépine & Strobl, (2013), I model child nutrition outcomes as a function of children's individual, parental, household and environmental characteristics. This categorisation is similar to determinants identified in the UNICEF (1998) framework and differs only in terminology. Going by this approach, it is easier to distinguish parental factors from other household factors linked to children's nutrition outcomes.

This study therefore models child nutrition outcomes, (Z_{ij}) as:

$$Z_{ij} = \alpha_0 + \sum SC_m + \sum_{j=1}^{Nh} \alpha_j HC_j + \sum_{j=1}^{Nh} \alpha_j PC_j + \sum_{j=1}^{Nh} \sum_{i=1}^N \alpha_{ij} CC_{ij} + U_{ij} \quad (3.2)$$

Where Z_{ij} represents the nutrition outcome (HFA , WFA , WFH) of child i from household j , HC_j the vector of household characteristics, PC_j the vector of parental characteristics and CC_{ij} is the vector of child characteristics. SC_m represent a vector of location-specific controls included in the model and U_{ij} the error term.

To the basic explanatory variables in the nutrition model, a vector of bargaining power measures are included in order to assess the impact of bargaining power on child nutrition. The resulting augmented nutrition-bargaining power model is based on an adaptation of the models used by Fafchamps, et al. (2009) and Schmidt (2012) for estimating child nutrition outcomes as shown in equation (3.3):

$$Z_{ij} = \alpha_0 + \sum SC_m + \sum_{j=1}^{Nh} \alpha_j HC_j + \sum_{j=1}^{Nh} \alpha_j PC_j + \sum_{j=1}^{Nh} \sum_{i=1}^N \alpha_{ij} CC_{ij} + \sum_{j=1}^{Nh} \alpha_j BP_j + e_{ij} \quad (3.3)$$

where BP_j is a vector of bargaining power variables.

The bargaining power effects are captured by the vector of coefficients α_j and provide the empirical focus of the subsequent analysis. Two measures of bargaining power are explored in this study. First, the effects of the general index of women's bargaining power $BPINDEX_{PCA}$ is analyzed followed by the analysis involving the categorical measures of bargaining power, where she has no power at all, where she has joint power and when she has sole power within a specific domain. The bargaining power coefficient α_j , is expected to be significant and positive, if women's bargaining power is positively related to child nutrition outcomes. This would imply from the model that women with higher bargaining power (measured by a woman's involvement in decision-making) have children with better nutrition outcomes.

Although one cannot predict a priori, what the coefficients for the categorical analysis will be, it is expected that compared to households where men have sole decision-making power for any given domain, children from households where women have sole decision-making power should have better outcomes if indeed, women's bargaining power is positively associated with child nutrition. It is also expected that the coefficient for joint balanced power (decision-making) will be positive compared with that for a man's sole bargaining power (decision-making). The implication is that children from households with balanced power have better nutrition outcomes relative to those from households where the woman has no power at all in that particular domain.

To compare the effects of balanced power with a woman's sole bargaining power on child nutrition outcomes, α_j are examined and a conclusion made regarding, which is better, based on the significance and the differences in magnitude of the coefficients for sole and joint decision-making. A larger coefficient would suggest better outcomes for that category. We next, discuss the empirical results.

3.4. Empirical Results

In this section, the estimated results of the effects of women's bargaining power on child nutrition are presented. This is preceded by a brief discussion on the determinants of height-for-age, which reflects the cumulative or long-term effects of child nutrition and then the results for the determinants of weight-for-height, which capture better, the effects of changes in short-term changes in nutrition. Next, the impact of women's bargain power is discussed using two measures of power- the constructed bargaining power index and the non-composite separate spheres measures of bargaining power.

Finally, we interrogate the data further using quantile regression analysis to understand further, how children at the lowest end of the nutrition distribution are affected by maternal bargaining power. Survey weights were applied in the regressions to obtain results which are nationally representative.

Tables A3.2 and A3.3. present the results of the estimated determinants of long-term nutrition, HFA and the short-term measure, WFA. In these tables, the individual, parent and household characteristics are added to the model in groups to allow for the determination of the baseline model. Beginning with a simple model, which only includes child characteristics (model 1) the mother's, and households' characteristics are included in subsequent models 2 to 4 respectively. Model 5 includes location and district fixed effects while in model 6 the father's characteristics are included²².

The results from the baseline model indicate that children's individual characteristics- age and birth weight and to some extent, the sex of the child in the case of long-term nutrition, are important determinants of nutrition. Also, in terms of mother characteristics, a mother's BMI and to varying extents, her being employed and earning at least as much as her partner, are positively associated with child nutrition outcomes. At the household level, ignoring father's characteristics, the presence of more wives is associated with worse nutrition outcomes for children, while those born to the most recently married wife seem to have better outcomes in the short-term. Finally, household wealth is an important determinant of child nutrition, with increasing wealth being positively associated with height-for-age, the measure of long-term nutrition. In

²² Based on the AIC, the model with the father's characteristics was dropped in favour of the more parsimonious model 5 as the basic model for the determinants of child nutrition.

addition to these basic determinants of child nutrition, the impact of bargaining power, the variable of interest, is considered.

The effects of women's bargaining power is discussed in two parts. Beginning with the effects of a woman's relative bargaining power measured by the decision-making index, we investigate the associations between a woman's involvement in decision making on child nutrition before considering the effects of her involvement in decisions related to specific domains.

Thus, the results for the bargaining index are presented first for HFA and then the shorter-term nutrition measure WFA, followed by the separate decision-making effects.

3.4.1 Effects of a woman's participation in all decisions

The summarised results for the impact of the woman's bargaining power indices are presented in Tables 3. 5 first for HFA in the first column and then for WFA in the second. Since the other determinants of nutrition included in the model change very little with each index of bargaining power used, I present the estimated coefficients for all other determinants included in the regressions in appendix 3, Table A3.4.

The key index of interest is the $BPINDEX_{PCA}$, which is a measure of a woman's overall involvement in decision-making in the household. There is no statistically significant association between the composite bargaining index, $BPINDEX_{PCA}$, and a child's height-for-age, nor is there any association between the unweighted decision index $Decisindex_{ALL}$ and HFA. However, when the unweighted bargaining index $Decisindex_{HH}$ is considered, there is a positive association between child HFA and a mother's

involvement in household decision-making regarding the spending of her and her partner's income and

Table 3. 5: Effects of Women's Bargaining Power (Constructed Indices) on Child Nutrition Outcomes

VARIABLES	HFA	WFA
<i>BPINDEX_{PCA}</i>	0.02 (0.027)	0.05*** (0.021)
<i>Decisindex_{ALL}</i>	0.02 (0.023)	0.05*** (0.018)
<i>Decisindex_{HH}</i>	0.05** (0.026)	0.09*** (0.031)
<i>Other Controls</i>	YES	YES
<i>District fixed effects</i>	YES	YES
<i>Observations</i>	2,154	2,154

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

the making of daily and large purchases. All other things being held constant, there is a 0.05 standard deviation increase associated with the HFA of a child with the average height for age, when their mother is involved in decision-making in one more domain of spending household income or making purchases. These results seem to suggest that a woman's overall bargaining power is not necessarily positively associated with a child's long term nutrition outcomes, however if that power is derived from her involvement in the spending of household income and the making of purchases, then it is associated with the cumulative measure of children's long term nutrition. The result from this latter measure of women's bargaining power, is more in agreement with the

findings of Fafchamps et al (2009) who find positive associations between a woman's participation in decision-making and child HFA in Ethiopia.

By contrast, the results indicate a statistically significant positive association between each of the three bargaining power indices and children's WFA. Specifically, for a child with an average WFA, a unit increase in $BPINDEX_{PCA}$ is associated with an increase in WFA by 0.05 standard deviations if all other factors are held constant. As a robustness check, similar results are obtained for the unweighted index, which suggest that at the mean WFA, for every additional decision a woman participates in making out of the seven, a child's weight-for-height increases by 0.05 standard deviations if all other factors are held constant. Also the results obtained when the WFH measure is are consistent with WFA. This suggests that a woman's participation in household decision-making may be child welfare-enhancing, in the short-term, even though the magnitudes are rather small²³.

We find even larger effects of a woman's involvement in household decision-making on child nutrition outcomes when only the four decisions regarding household spending and purchases are considered, corroborating the importance of a woman's involvement in decisions regarding daily and large purchases as well as how to spend her husband's income and hers. This is however investigated further by exploring how a woman's relative power in each separate decision-making sphere may be related to child nutrition outcomes.

²³ Following Lépine and Strobl's (2013) findings on the underestimation of the effects of bargaining power due to endogeneity, an attempt is made to address similar concerns in this study. $BPINDEX$ is instrumented for using two exogenous variables - religion and belonging to a matrilineal heritage. We select these instruments because all other things being equal, women who belonging to a matrilineal lineage tend to be more empowered and are therefore expected to have more bargaining power. Second, due to its permission of polygamy and the more subservient role assigned to women in Islam, one would expect women from Muslim households to be less empowered, whereas in contrast women practising no religion, Christianity and traditional religion, are thought to have more bargaining power.) However, I find these to be weak instruments of women's bargaining power, yielding insignificant estimates of the effects of bargaining power on child nutrition outcomes. As a result, we do not present the IV results here but they are presented in Appendix Table A3. 5.

3.4.2 Effects of a woman's participation in specific decisions

The effects of a woman's bargaining power, is investigated next with regard to separate decisions and how balanced power or sole women's power exercised in specific decision domains is child welfare enhancing. Unlike the general bargaining power index which attaches the same weight to her making sole decisions and joint decisions, in the ensuing analysis, the two are regarded as distinct. All four possible responses as discussed in section 3, regarding who makes decisions, are considered for each domain and included as dummy variables excluding sole decision-making by the man which is the reference category. Since the focus of this analysis is the relative power between the woman and her partner, the results of the fourth category where the response is that other people make the decision in question, are not reported here

No significant results are obtained for decisions about daily purchases even though groceries and food which are more related to nutrition, would have been expected to form a large component of such purchases. Similarly, the coefficients for decisions about large purchases as well as decisions about the woman's health are not statistically significantly different from zero, therefore those are excluded from the ensuing discussion and results are only presented for decisions regarding spending the man and woman's incomes, decisions regarding her visits to family and decisions regarding the number of children to have. First, the results for HFA shown in Table 3. 6 are considered.

Long-term Nutrition Measure: HFA

Model 1 in Table 3. 6 indicates that children have better long-term nutrition outcomes when both parents decide on how to spend the woman's income, relative to their

father making the decision alone. All other things being held equal, children from households in which the decision about spending their mothers' income is made jointly are on average, 0.33 standard deviations taller than the median height of the WHO reference group of well-nourished children.

The results also suggest that such children have better outcomes than those from households in which the mother has the final say regarding decisions on spending her income alone (0.25 standard deviations and only marginally significant at 10%). It can thus be inferred, that relative to households in which the woman has the final say in decisions about spending her income, children from households where joint decisions are made have better nutrition outcomes and both categories of children have better outcomes than those from households where the man has the final say.

Table 3. 6: Separate Spheres: Joint versus sole decision-making (Dependent Variable: HFA)

<i>Sphere and type of decision:</i>	<i>(1) Spending her income</i>	<i>(2) Spending his income</i>	<i>(3) Visits to her family</i>	<i>(4) Number of children</i>
<i>Woman alone</i>	0.25* (0.141)	0.01 (0.143)	-0.16 (0.121)	-0.12 (0.142)
<i>Both</i>	0.33** (0.154)	0.09 (0.081)	0.10 (0.099)	0.17* (0.102)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>District Fixed Effects</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	2,154	2,154	2,154	2,154
<i>R-squared</i>	0.208	0.207	0.210	0.209

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

Similarly, the results in model 4 indicate that the average child from households in which parents make joint decisions regarding the number of children to have has higher HFA z-scores relative to the average child from households which report the man as having the final say. Their height-for-age scores are about 0.17 standard deviations more than children whose fathers have the final say about what number of children to have, but this is only marginally significant at 10%.

What this implies is that, although children have better long-term nutrition outcomes when women rather than men have the final say, they are even better off when both parents decide together. These findings are in agreement with Basu (2006) and Gitter and Bahram (2008), who suggest that in the long-term, it is balanced, rather than absolute women's decision-making power that may be best for children's welfare outcomes. However, these inferences are based on only two decision domains out of the seven considered, and therefore it is important to consider the larger picture. In that respect, the results show a rather weak association between women's bargaining power and HFA. It seems therefore, that there is no direct effect of mothers bargaining power on child long-term nutrition. Next is a discussion of the results for WFA.

Short-term Nutrition Measure: Weight-for-height

Table 3.7 presents the results for WFA for each of the four decisions under consideration. Here, there is a clearer indication of a consistent positive association between child WFA and joint decision-making, relative to male sole decision-making and child WFA

Table 3. 7: Separate Spheres: Joint verses sole decision-making (Dependent Variable: WFA)

<i>Sphere and type of decision:</i>	<i>(1) Spending her income</i>	<i>(2) Spending his income</i>	<i>(3) Visits to her family</i>	<i>(4) Number of children</i>
<i>Woman alone</i>	0.16 (0.121)	0.21* (0.110)	0.05 (0.092)	0.20* (0.104)
<i>Both</i>	0.23* (0.128)	0.14** (0.064)	0.16** (0.076)	0.27*** (0.076)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>District Fixed Effects</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	2,154	2,154	2,154	2,154
<i>R-squared</i>	0.179	0.184	0.179	0.183

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

The coefficients are statistically significant at 5% level of significance and the signs of the coefficients suggest better outcomes for children in households where decisions are taken jointly. These results are relative to households where the man is the sole decision maker about how to spend his income (0.14 standard deviations more), visits to her family (0.16 standard deviations heavier) and (0.27 standard deviations more). Further, I find that relative to households with men being the sole decision maker, children from households where women have an upper hand in decisions regarding spending his income or the number of children to have, have better nutrition outcomes although the coefficients are only marginally (at 10%) statistically significantly different from zero. Results for WFH are presented in appendix 3, table A3.6 as a robustness

check. They show that children have better nutrition outcomes in households where mothers are involved in decision-making either alone or jointly in all except decisions related to spending her income for which there are no statistically significant coefficients.

Thus from the preceding results, I find that, in contrast with the weak association between HFA and women's bargaining power, if a woman's household decision-making is used as a measure of her bargaining power, there is a statistically strong indication that her bargaining power is positively associated with her children's short-term nutrition. We also find that relative to households where the father is the sole decision-maker, children have relatively better outcomes in households where joint decisions are made, followed by households where the woman takes those decisions alone.

Next, one may wonder if these results hold for all children, or how relevant they would be to policy formulation aimed at reducing undernutrition in SSA. To answer the question, quantile regression analysis is employed to determine how these results may differ or otherwise along different parts of the nutrition distribution. We particularly focus on the results of the interquartile range, however since policy is often targeted at effecting changes among the most under nourished we also include results for the 10 centile (or the first decile) Selected quantile regression results are presented next.

Quantile regression results

The results for the quantile regression estimates are presented and discussed next for general bargaining power index. As mentioned earlier, these estimates are expected to provide a clearer understanding of how changes in women's bargaining power affects

children's nutrition outcomes at the lower end of the tail of the child nutrition distribution. This allows us to further understand how the mother's bargaining power affects malnourished children who are also most likely to be targets of policy interventions required to reduce malnutrition at the lower quartile, or severe malnutrition at the lowest decile.

The analysis is therefore carried out for the first decile and the inter-quartile range, to gain more understanding regarding the under nourished and severely undernourished. These results are presented in Table 3. 8 as models 1-4 with model 1 representing the regression at the 10th centile, while models 2-4 represent the 25th, 50th and 75th centiles respectively. As before, there is no indication of a statistically significant association between a woman's bargaining power and HFA, reconfirming the earlier results obtained. It is only in the case of the lowest decile that bargaining power is marginally significantly associated with children's height-for-age.

Table 3. 8: Women's Bargaining Power by Nutrition Quantiles (dependent variable: HFA)

	(1)	(2)	(3)	(4)
VARIABLES	C₁₀	C₂₅	C₅₀	C₇₅
BPINDEX_{PCA}	0.07*	0.03	0.01	-0.03
	(0.040)	(0.028)	(0.021)	(0.028)
Controls	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,154	2,154	2,154	2,154

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

Thus the results suggest holding everything else constant, an increase in HFA by 0.07 standard deviations of a child with a height-for-age at the tenth centile, for every additional sphere of decision in which the woman participates. This suggest that among the severely stunted, an increase in a woman's bargaining power could improve a child's long-term nutrition outcomes.

One also finds for the shorter-term measures that, there is a significant association between women's bargaining power and child weight (Table 3. 9), with a larger degree of association at the 10th centile where every additional sphere in which a woman participates in decision-making, is associated with a 0.06 standard deviation increase in WFA. A much smaller effect of (0.03) is obtained at the 25th centile.

Table 3. 9: Women's Bargaining Power by Nutrition Quantiles-WFA

VARIABLES	(1) C₁₀	(2) C₂₅	(3) C₅₀	(4) C₇₅
BPINDEX_{pca}	0.06*** (0.022)	0.03* (0.019)	0.04*** (0.014)	0.04* (0.024)
Controls	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,154	2,154	2,154	2,154

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

Thus the quantile analysis suggests only marginally significant associations between bargaining power and HFA among the severely stunted, which implies that a mother's bargaining power is a potentially important determinant of the long term nutrition of the very stunted children even though other factors may be more important determinants of children's long-term nutrition rather than women's bargaining power. However, the existence of significant associations between bargaining power and weight-for-age, among underweight children suggests that it may be a useful tool for improving children's nutrition outcomes in the short-term.

Having analysed the data for Ghana, I next consider how these results compare with other studies. First the findings corroborate those of earlier studies that women's relative bargaining power is positively associated with better children's' nutrition outcomes. (Duflo, 2003; Smith et al, 2003; Fafchamps et al, 2009; Schmidt, 2012; and Lépine and Strobl, 2013). For example, Smith et al, (2003) find for sub-Saharan Africa, that at the mean, a 10-point increase in their constructed decision-making index, would raise the mean weight-for-age by 0.046 standard deviations. This study finds similar results for Ghana where on average, an increase in the bargaining power index, constructed using the principal components analysis, is associated with an increase in the mean weight-for-age by 0.05 standard deviations. Also, similar to my findings, their study finds more statistically significant effects between children's short term nutrition effects –wasting and underweight- and mothers decision-making as compared with the long term measures of child nutrition. In addition, the findings of Lépine and Strobl, (2013) who also examine the effects of women's bargaining power- measured as decision-making power- on the nutrition outcomes of rural Senegalese children, have

also concluded that increased women's bargaining power is associated with better nutrition measured by the mid-upper arm circumference (MUAC).

Our study also corroborated findings of studies, which use different measures of women's bargaining power or child nutrition. For example, using different measures of women's relative bargaining power for Ethiopia but similar child nutrition outcomes, Fafchamps et al, (2009) found evidence of better child nutrition outcomes in households where the women are more empowered. Duflo, (2003) finds improved girls nutrition outcomes in south African households where grandmothers benefit from a change in legislation which provides them with transfers in the form of a pension.

So far, Schmidt , (2012) is one of the studies which have examined the effects of the different domains of women's involvement in household decision-making and child nutrition outcomes. As with our study, his study finds a positive correlation between child health outcomes and belonging to a household where mothers have decision-making power. When they further examine the effects of a woman's decision-making power in the different domains of decisions, he arrives at the conclusion as we do, that not all decision-making power is child welfare-enhancing. Their results, for Bangladesh suggest that certain aspects of bargaining power, such as female participation in decision-making about child health care, large household purchases and daily needs, are associated with larger child height-for-age z-scores. This is at variance with my findings for Ghana, where with I find stronger effects of women's decision-making power in different domains as important determinants of children's short term nutrition outcomes rather than the long term nutrition outcome. Schmidt however fails to

explore the different effects of a mother's joint decision-making power, as compared with sole power or the lack thereof as I do.

3.5 Conclusion

This study investigated the effects of a woman's relative bargaining power on child nutrition outcomes using data from Ghana. The analysis, employs two measures of direct bargaining power based on women's involvement in household decision-making in seven domains of household decisions. Based on ordinary least squares analysis, a number of key findings emerge from the results which are highlighted in this section followed by a discussion of the limitations of the study.

In general, a woman's involvement in household decision-making, whether solely or jointly, is positively associated with children's short-term nutrition measure, WFH, however for the long-term measure, no significant association is found. From the results obtained, not all decisions are necessarily significantly associated with child nutrition. Of the six spheres considered only decisions regarding spending the woman and her partner's incomes, visits to her family and the number of children to have, are significantly associated with child nutrition outcomes.

Quite interestingly, in relation to decisions, better child nutrition outcomes are associated with households in which these decisions are taken jointly relative to households in which the woman unilaterally makes those decisions. Specifically, the results show in relation to a child's long-term nutrition that, balanced bargaining power, represented by having an equal say in decision-making in relation to spending, family size and visits to her family is associated with better child outcomes, when compared

with households that engaged in sole decision-making by the woman or the man. I however find that in sole-decision-making households, worse child nutrition outcomes are associated with men's sole decision-making relative to women's sole decision-making. Among more malnourished children, however it appears as if a mother's bargaining power is more significantly associated with short-term (WFA), rather than long-term (HFA) nutrition.

The findings of this study confirm what has been found in previous studies using African data (such as Duflo, 2003 for South Africa, Doss, 2006 for Ghana and Fafchamps et al, 2009 for Ethiopia), that relatively, women's bargaining power is positively associated with better welfare of children compared with that of fathers which is negatively associated with child welfare. However, the additional evidence from this study is that children's welfare is even better in households where there is a power balance in parental power.

We also find that the spheres of a woman's control, which are most relevant to influencing child nutrition, are in the decisions about spending their incomes and her visits to family (which may be regarded as her freedom to associate) or decisions about how many children to have. These are an indication to policy makers that in aiming to empower women it is most beneficial to children if that empowerment enhances the woman's engagement in household decisions bordering on spending, on fertility and the woman's freedom of association. In this regard, the promotion of women and girls' education, seeking to change social norms, which assign women a subsidiary role in household decisions, would be beneficial for children's welfare. In addition, it will be important to address issues of women's mobility and freedom of association, in cultures

where women's movements are restricted because of traditional, religious or social norms.

Most of all however, in the pursuit of improved nutrition outcomes for children, it is worth noting that tipping the power balance in favour of women may not necessarily always be welfare-enhancing. In this regard, programs aimed at empowering women should focus on raising them to levels of power where they can effectively engage and negotiate with their partners as equals in the allocation of household resources. This implies that providing economic empowerment such as cash incentives or micro credit facilities to women in themselves may not be effective ways of improving children's nutrition if cultural norms for example require her to still leave the decision-making solely to her husband or partner.

This also implies that in poorer households who tend to be at the lower end of the distribution policies aimed at enhancing children's nutrition outcomes should also focus on raising women's status to attain some form of a power balance within the household. That way, women can engage and influence decisions that are ultimately linked with child nutrition since indeed the women's bargaining power and child welfare nexus is much more complex than previously highlighted.

This study is however not without limitations. First, the conclusions will have to be considered in the light of the fact that the data used in the analysis is cross-sectional and fails to provide a dynamic representation of how nutrition outcomes change with bargaining power over time. Whereas such a study will provide useful insights, every wave of the DHS surveys, is conducted for a different cohort of children and not necessarily the same women thus the absence of panel data makes it impossible to

determine how changes in bargaining power and child nutrition might be linked over time.

In addition, while useful insights could be gained from understanding how women's bargaining power is linked to child nutrition in single parent families, the focus of this paper is limited to children born to monogamous and polygamous couples because the survey is set up to collect decision-making information only from couples/partners. One possible approach would have been to include children from single headed households and assign the full decision-making power to the parent in question. However, given the levels of involvement of the extended family in the lives of single parent families within the Ghanaian society, adopting that approach may be over-simplistic and the results misleading. Consequently, I simply sound a note of caution regarding the interpretation of these research findings that they are not applicable to the nutrition of children from single headed households.

Lastly, since non-living children were excluded from the analysis, our estimates could potentially be biased. Given that about 33 percent of under-five mortality in SSA is due to malnutrition (UNCF), this implies that our measures of nutrition under-report the extreme forms of malnutrition and therefore our estimates of the effects of mother's decision-making on nutrition outcomes are biased downwards. While the bias could be addressed using a Heckman selectivity model, this approach was abandoned since it was not possible to find determinants of mortality, which were mutually exclusive to determinants of nutrition.

Whereas the understanding of the links between women's intra-household bargaining and child nutrition is important, the availability of quality data remains a major limitation for research on developing countries. Even though, the availability of

decision-making data in the DHS addresses the challenges associated with measuring women's bargaining power, it will be insightful if in future panel data of similar quality as the DHS surveys could be collected for Sub-Saharan Africa to facilitate the analysis of the dynamic effects of changes in women's bargaining power on child welfare. Second, the availability of data on decision-making in single parent households could provide potentially interesting insights and make it possible to analyse more comprehensively how bargaining power affects children in all types of households. If the data limitations are addressed, these, in my opinion, will be interesting areas for future research.

4. Mothers' Experience of Domestic Violence and Child Survival: Evidence from Sub-Saharan Africa

4.1 Introduction

Domestic violence is defined by Holden (2003) as "assaultive and coercive behaviours that adults use against their intimate partners". The United Nations' Declaration on the Elimination of Violence against Women defines violence against women in more detail as

".... any act of gender-based violence that results in, or is likely to result in, physical, sexual or mental harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life." *United Nations (1993)*

Based on this definition, estimates available from 2010 suggest that about one in three women worldwide aged 15 years or more has experienced physical or sexual violence in their lifetime. In six out of every seven of these cases, the violence was perpetrated by a current or former intimate partner (WHO 2013).

Given that these estimates are restricted to sexual and physical violence against women, domestic violence against women is potentially higher when defined more broadly to include

" ...the threats of such acts, coercion or arbitrary deprivation of liberty...". *United Nations (1993)*

The high prevalence of domestic violence against women by an intimate partner is a global public health concern whose effects are not only limited to the women themselves, but potentially extend to their children. A woman's experience of violence from her intimate partner could erode her relative power within the household and potentially shift intra-household power away from women. If women's preferences are more aligned to the wellbeing of their children than men, as suggested by an array of studies (see Lundberg, Pollakk and Wales, 1997; Duflo, 2003 for example), then their experience of domestic violence can potentially be detrimental for the wellbeing of children. If, however, as other studies (see Holden & Ritchie, 1991, Levendosky, Lynch, and Graham Berman, 2000 Letourneau, Fedick, & Willms, 2007; Casanueva, Martin, Runyan, Barth, & Bradley, 2008) suggest, such women adopt compensatory responses towards their children, then a woman's experience of domestic violence may not be associated with negative child welfare outcomes.

From a biomedical perspective, several factors are known to affect infant survival, key among which are maternal factors, nutrition, disease, injury and environmental factors.²⁴ The centrality of a mother's role in caring for her children in their earlier years implies that none of these factors can be considered in isolation without the mother's involvement. Typically, an empowered woman is depicted as one who is also able to make choices that promote the wellbeing of her children, including choices related to their nutrition or the prevention of disease and healthcare choices during and after pregnancy. However, what happens when she experiences domestic violence and probably more crucial to our study, how does her experience of violence affect the survival of her young children?

²⁴ For a more detailed discussion, see the framework developed in UN (1990).

The existing evidence on the effects of women's experience of violence on child health is limited in several respects. First, many of the earlier studies were from developed countries (Attala and McSweeney, 1997; Montgomery et al, 1997) and often based on small samples (Rao, 1997; Mcfarlane and Soeken, 1999). Second, until recently, there have been few studies which address the effects of domestic violence on child welfare outcomes in Sub-Saharan Africa. The few existing studies on Sub-Saharan Africa, focus on the effects of domestic violence on older children; moreover, the conclusions are mixed. (Rico et al, 2011; Odimegwu et al, 2014).

Yet, Sub-Saharan Africa has a high incidence of both domestic violence and child mortality rates. The World Health Organisation (WHO) in 2013 estimated that 37 percent of ever partnered women in Africa have been victims of physical and/or sexual violence perpetrated by an intimate partner, or have experienced sexual violence from a non-intimate partner in their lifetime (WHO, 2013). Other evidence suggests prevalence levels of 27 percent for Malawi (Borwankar et al, 2008), 59 percent for Uganda and 46 percent in Kenya (Rico et al, 2011). These figures might even understate the prevalence of domestic violence due to the tendency for victims to underreport such incidents.

On a regional level, Sub-Saharan Africa also has the highest incidence of under-five mortality in the world. With one in every twelve live children born dying before the age of five, a child born in the region is twice more likely to die before their fifth birthday than one born in the developing world, and fifteen times more likely than a child born in the developed world (World Bank, 2014). Even more marked is the fact that about 75 percent of all under-five mortality takes place during the first 12 months of a child's life.

In 2015 alone, 4.5 million out of 5.9 million deaths of children under the age of five, died before they turned one UNICEF (2016).

This study, therefore broadly seeks to determine the effects, if any, of a woman's experience of domestic violence on infant survival for Sub-Saharan Africa. Specifically, it seeks answers to the questions:

a) Does a woman's experience of domestic violence from her intimate partner affect the survival of her children during their first year of life?

b) Are these effects, if any, mediated by other factors? What are the possible channels?

The analysis is carried out using recently available data on domestic violence and child mortality from the Demographic and Health Surveys (DHS) conducted in six Sub-Saharan African countries between the years 2008 and 2013. The countries included are Burkina Faso, La Cote d'Ivoire, Ghana, Kenya, Nigeria, and Zimbabwe.

As part of the DHS surveys, household and individual level information was collected from all women in their reproductive age (15 to 49 years). Child information was also collected from all women concerning living and non-living children born to them in the 59 months preceding the survey including data on child mortality. In addition, one woman per household was further selected at random to answer the domestic violence questionnaire. (See appendix 4, Figure A4.1). For the purposes of this study, the sample of interest is limited to women who were partnered at the time the domestic violence questionnaire was administered and who had children aged between one and five years.

The key variable of interest, women's experience of domestic violence, is constructed based on the UN definition of violence against women (UN 1993) as any act of violence *"..... that results in, or is likely to result in, physical, sexual or mental harm or suffering to women."* To allow for comparability of my results with previous studies which have used the DHS data, (for example, Rawlings and Siddique, 2014; Kishor and Bradely, 2012 and Hindin et al, 2008) four measures of domestic violence are generated and used in the analysis. These are based on whether a woman has suffered any form of *psychological or emotional violence, physical violence, sexual violence or any of the three forms of violence*, from her most recent intimate partner.

The effects of a mother's experience of violence on infant mortality is estimated while controlling for other child, maternal and household factors that are known to influence child mortality. A two-step modelling approach is used to examine whether the effects of a mothers' exposure to domestic violence on child mortality is mediated by a selection of channels as proposed by Yount et al (2001) and discussed in more detail in chapter 2. We do this with the aim of elucidating how the effects of domestic violence of children may be mediated through these channels.

For example, when a woman is a victim of violence, her physical wellbeing could be affected through bodily harm, fatigue or disability or inadequate nutrition. It might also impair her judgement and reflected in unsatisfactory choices in prenatal and delivery care. This study focuses on exploring how a mother's experience of domestic violence on a child's survival may be mediated by their mother's nutrition status and her use of antenatal care. It is expected *a priori* that, a woman exposed to domestic violence might have poor nutritional outcomes, which might lead to her providing worse care or

making poor choices regarding antenatal care for her child than she otherwise would and consequently affect the child's survival²⁵. A country level analysis is shown to provide a better fit of the data than a pooled sample.

The analysis gives rise to mixed results, suggesting that the effects of a mother's experience of violence on infant mortality is not uniform across countries. Specifically, the study provides limited evidence of direct effects of a woman's experience of violence on child survival for Ghana and Kenya. The odds of a child dying before their first birthday is 125 percentage points higher for mothers who had experienced physical violence and 99 percentage points higher if they reported experiencing any form of violence, holding all other factors constant. Similarly, the results for Kenya show that on average, children born to women who reported experiencing emotional abuse had a 99 percentage points increased odds of dying before their first birthday. The evidence for the remaining countries suggests that other factors, rather than a mother's experience of domestic violence, are more important in explaining infant survival.

Second, the analyses present no evidence that a mother's use of antenatal care, or her nutrition status, are channels through which the effects of a mother's experience of domestic violence on infant mortality may be mediated. These results suggest that while the importance of women's exposure to domestic violence for child survival cannot be downplayed, it may be presumptuous to generalise its effects without considering country-specific evidence.

A review of the relevant literature is presented next in section 4.2, followed by a discussion of the methodology and descriptive analysis of the data in sections 4.3 and

The two-step analysis is followed by an analysis of the effects of a woman's experience of violence on nutrition and disease which are not reported but available in appendix 4.²⁵

4.4 respectively. The results are discussed in section 4.5 while section 4.6 concludes the study.

4.2 Literature Review

Following the definition of domestic violence in the UN declaration (1993), three main types of domestic violence are commonly used in the literature, namely emotional, physical, and sexual violence. Emotional violence may take the form of verbal abuse, threats, humiliation, and control or manipulation of the victim whilst physical violence entails pushing or dragging, hitting, or the use of weapons against the victim. Sexual violence, on the other hand, involves forcing someone to perform sexual acts against their will, or without their consent. Other strands of literature identify a fourth kind of abuse – termed economic abuse, which involves manipulative behaviour calculated to limit economic empowerment of one’s intimate partner, in order to be able to exert control over them.

The ensuing review however excludes economic abuse on which there is limited empirical research but beyond the scope of this study due to data limitations. With a focus on physical, sexual and emotional domestic violence, this section reviews the empirical literature on the effects of domestic violence against women on child survival.

Most empirical studies point to a positive association between a woman’s experience of violence and a child’s wellbeing during their early years with the majority coming from the bio-medical literature. The key factors known to be closely associated with child survival include birth outcomes such as a child’s weight at birth, their nutrition, and susceptibility to diseases and mortality. The ensuing empirical review is based on

studies whose focus has been on modelling the effects of domestic violence on child mortality.

The empirical evidence, suggests a positive association between a mother's experience of violence and child malnutrition (see Montgomery et al, 1997, Rao, 1997, McFarlene and Soeken, 1999, Asling-Monemi et al, 2009, Salazar et al 2012). However, only a few of these studies present evidence from sub-Saharan Africa. For example, Montgomery et al, (1997) is based on UK data, McFarlene and Soeken, (1999) on data from the USA, Asling-Monemi et al, (2009) on Bangladesh data, Rao, (1997), on Indian data, and Arcos et al, (2003) on Chilean data. The other limitation with these studies is the fact that they are often based on small samples (example McFarlene and Soeken, 1999, n=121; Salazar et al, 2012, n=461). None-the-less the analytical methods adopted in these studies provide a useful tool for the current study.

For example, Montgomery et al (1997) explore the subject using data from the British National Development Study (BNDS). They used multiple logistic regression analysis, in which they made adjustments for confounders such as social class, crowding and gender while also controlling for *“fully attained adult height as a measure of genetically predetermined height”*. Based on the analysis of data collected on a relatively large sample of 6,574 British children born between 3 and 9 March 1958, they concluded that a mother's exposure to domestic violence was associated with “higher odds of short stature” at age seven. The dependent variable was height divided at the bottom fifth of the height distribution at age 7 years to form a binary variable.

Similarly, Asling-Monemi et al (2009) find poorer nutrition and birth outcomes among women who experience domestic violence in rural Bangladesh. Their findings were

based on the analysis of longitudinal data collected on a sample of 3164 live-born children over a two-year period and analysed using general linear modelling techniques. They investigate the effects of different forms of violence on the z scores of child anthropometric measures – height-for-age (HFA), weight-for-age (WFA) and weight-for-height (WFH) while adjusting for confounders. In the context of rural Bangladesh, they identified a woman being in a maternal intervention group; mother's age and education, the birth order of the child, household wealth measured by an asset score; the duration of exclusive breast-feeding of the child and religion as potential confounders. They however found that even after adjusting for these confounders, there was a statistically significant negative association between a mother's exposure to violence and children's HFA and WFA z-scores. For boys and girls and across all age groups. They also found that exposure to violence was associated with lower birthweight and slower growth rates.

It has only been with the collection of domestic violence data by the DHS that studies have begun to emerge on its effects on child health however, the evidence from Sub-Saharan Africa is however rather mixed. For example, in a five-country study²⁶ including four sub-Saharan African countries, Rico et al (2011) investigate the relationship between a mother's exposure to domestic violence and child health using DHS data. The focus of their analyses were child nutrition and mortality of children under the age of 2 years. This study used logistic regression analysis to generate odds ratios of the associations between different categories of maternal exposure to domestic violence and child under-2-year- mortality, moderate and severe stunting. The study made adjustments for potential confounders, and further explored the role of mediating factors.

²⁶ Egypt, Honduras, Kenya, Malawi and Rwanda

The key finding related to the sub-Saharan African countries in their study was that women's experience of domestic violence was important in explaining child malnutrition and mortality in Kenya and Malawi. Defining intimate partner violence as being exposed to sexual or physical abuse, their study finds positive associations between a mother's experience of domestic violence and mortality among children under the age of two from Kenya and to a weaker extent, Malawi (adjusted odds ratio of 1.42 and 1.12 respectively). No significant associations were found for Egypt and Rwanda.

Their sample included all children born between two and eight years before the survey. The estimates were obtained after controlling for maternal characteristics (age, education, number of living children, urban/rural residence, and household wealth) and mediating variables at the mother and child level. At the child level, mediating variables used were whether or not the pregnancy was wanted, duration of breastfeeding, and vaccination. At the mother's level, the mediating variables included were whether the mother had made at least four antenatal care visits, received a tetanus vaccination before delivery, and was attended to by skilled health personnel during delivery. The study by Rico et al (2011) however, does not include countries from the Western regions of Sub-Saharan Africa.

Kishor and Bradley (2012) explore the domestic violence question further, but from the perspectives of both men and women. Using DHS data for Ghana and Uganda, they find a positive association between a woman being the victim of intimate partner violence and child mortality or having a non-live birth. They also find similar effects for Ghana in relation to having a child who is stunted (it was only possible to carry out this analysis

for Ghana only but not Uganda due to data constraints). Their study uses a broader definition of violence covering all acts of emotional, physical, sexual abuse, as well as controlling behaviour, while the child mortality measure is defined to include any child who had died, irrespective of age or time of birth. Based on logistic regression analysis, and after adjusting for the respondent's age, education, area of residence, wealth quintile and total number of children ever born, they find increased odds of mortality for children born to abused mothers of 61 percent for Ghana, based on women's self-reported experience, but no such significant association for Uganda. What is interesting for Uganda, however, is the fact that the odds of child mortality among abused mothers increases by 75 percent based on men's reports of perpetrating violence against their spouses. While Kishor and Bradley (2012) provide useful insights into the domestic violence-child mortality effects, their definition of child mortality as having ever had a child who died, is rather broad and their results may be subject to biases resulting from recall error.

Again, a three-country study on Sub-Saharan Africa, covering Burkina Faso, Cameroon and Zimbabwe conducted by Odimegwu et al (2014) finds limited evidence of the positive associations of women's experience of domestic violence on child health. Using data from the DHS. Their study explores the effects of a mother's experience of three forms of domestic violence (emotional, physical and sexual) on three child health outcomes- birthweight, stunting and child mortality. Logistic regressions are used to estimate the odds ratios of the associations between a mother's experience of violence and birthweight and stunting, while Cox proportional hazard regression techniques are used in estimating the effects of women's experience of intimate partner violence on under-five mortality.

Their study found limited evidence linking a mother's exposure to violence and child health. Specifically, they did not find any statistically significant associations between intimate partner violence and birthweight for any of the three countries and it was only for Cameroon they found a high risk of under-five mortality among children whose mothers' reported exposure to physical and but exposure to sexual violence only was negatively associated with under-five mortality. However, they found for Burkina Faso that children whose mothers experience emotional abuse had higher odds of stunting compared to children whose mothers had not experienced emotional abuse, while in Zimbabwe, women's experience of physical violence was associated with higher odds of stunting among their children.

These results were robust even after the study controlled for maternal factors such as age, place of residence, religion, marital status, age at first delivery, number of living children, maternal education, maternal working status and the household wealth index in addition to skill of antenatal care provider, place of delivery and birth weight, in their model of child mortality. More recently, Rawlings and Siddique (2014) use DHS data from 41 surveys²⁷ to conduct a multi-country study of 30 developing countries (including SSA). Their study, analyses the effects of a woman being a victim of a) physical and b) any form of violence on infant mortality among other maternal and child health outcomes. Controlling for child, parent and household characteristics they estimate the effects of spousal and physical domestic abuse on children with country-year fixed effects. They find that children born to mothers who experience any form of domestic violence are 0.9 percentage points more likely to die before their first birthday compared to children whose mothers are not victims of domestic violence. Moreover,

²⁷ Including more than one survey from some countries.

children whose mothers were physically abused were 0.8 percentage points more likely to die within their first year of life than children whose mothers suffered no abuse.

While Rawlings and Siddique (2014) makes useful contributions to the understanding of the links between women's experience of violence and child mortality, their study stops short of examining what differences might exist at the country level. Yet there are varied socio-cultural beliefs and norms among different communities across regions and countries, which may influence the child welfare effects of a mother's experience of domestic violence but may not be accounted for by controlling for country fixed effects. It is my view that a country-level analyses will further enrich the discourse on how child mortality is affected by mothers' experience of violence by providing further insights for Sub-Saharan Africa.

Reviewing these studies, although the conceptual framework suggests the effects of a mother's experience of violence on child mortality may be mediated by other factors, I find that it is given limited attention in empirical studies. Rico et al (2011) acknowledge the importance of mediating factors, but stop short of using a two-step estimation method to account for mediating factors. When Dávalos and Santos (2006) on the other hand explore the indirect effects of a woman's experience of domestic violence on child welfare their focus is on child nutrition. Their study which is based on DHS data from three Latin American countries, concludes that a woman's experience of violence has adverse effects on a child's long term nutritional status. It further finds that the effects are mediated by the mother's demand for health inputs which are her use of antenatal care, immunising the child and breastfeeding. Other studies, which have also used the

DHS data, however do not explore the potential indirect links between women's experience of violence and child health and nutrition.

Second, it emerges from the studies on Sub-Saharan Africa that the effects of domestic violence on children's survival may indeed vary from country to country and the measure of DV in question. This calls for additional evidence from sub-Saharan Africa. More so, given how critical the first year of life is to survival, it will be useful to shed more light on the effects of a mother's experience of violence on infant mortality. Yet one of the gaps in the literature is the failure to address the question of what the impact of a mother's experience of violence is on infant mortality. While Rico et al (2011) come close to studying the impact on children under the age of two, their inclusion of births which may have taken place up to eight years before the survey may lead to recall errors on the part of the mothers being interviewed, biasing their results. Lastly, although while it is widely accepted that sometimes the links between women's experience of violence and child welfare may be indirect, there are few studies which address how the effects of women's experience of violence on child survival, may be mediated by other factors. This study seeks to address these gaps in the literature using the DHS data.

4.3 Data and Descriptive Statistics

In this section, the data for analysis are presented descriptively. The section begins first with a description of the sample and its source, followed by a descriptive analysis of a woman's experience of domestic violence, then infant mortality and potential associations between them.

4.3.1 The sample

The sample used in the analysis of this study is drawn from six Sub-Saharan African countries where data on domestic violence and child mortality was collected as part of the DHS surveys between the years 2008 and 2013. The countries included are Burkina Faso, La Cote d'Ivoire, Ghana, Kenya, Nigeria, and Zimbabwe.

As part of the DHS surveys, household and individual level information was collected from all women in their reproductive age (15 to 49 years). Child information was also collected from all women concerning living and non-living children born to them in the 59 months preceding the survey including data on child mortality. In addition, one woman per household was further selected at random to answer the domestic violence questionnaire. (See appendix 4, Figure A4.1). For the purposes of this study, the sample of interest is limited to women who were partnered at the time the domestic violence questionnaire was administered and who had children aged between one and five years.

The key variable of interest, women's experience of domestic violence, is constructed based on the UN definition of violence against women (UN 1993) as any act of violence *"..... that results in, or is likely to result in, physical, sexual or mental harm or suffering to women."*

Next, I analyse the sample characteristics descriptively by country. Table 4.1 reports the sample characteristics for each country in the study. In relation to child characteristics, all the children sampled were born between 2003 and 2013 however for the purposes

Table 4. 1: Sample characteristics by country

<i>Variable</i>	<i>BF</i>		<i>CI</i>		<i>GH</i>		<i>KE</i>		<i>NG</i>		<i>ZW</i>	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Male</i>	0.51	0.50	0.52	0.50	0.53	0.50	0.51	0.50	0.51	0.50	0.50	0.50
<i>Birth Order</i>	3.62	2.26	3.74	2.28	3.43	2.03	3.36	2.09	3.48	2.21	2.59	1.56
<i>Multiple birth</i>	0.04	0.19	0.05	0.22	0.05	0.22	0.03	0.17	0.03	0.16	0.02	0.15
<i>Low birth weight</i>	0.13	0.34	0.14	0.34	0.16	0.36	0.16	0.37	0.14	0.35	0.12	0.32
<i>Child's birth year (-2000)</i>	7.83	1.46	9.27	1.41	5.90	1.49	6.08	1.45	10.44	1.48	8.22	1.46
<i>Mothers Age</i>	28.54	6.44	29.20	6.65	29.81	6.50	27.99	5.96	28.01	6.00	27.24	5.78
<i>Mother's Educ. (yrs.)</i>	0.99	2.48	1.51	2.86	4.12	4.29	6.64	4.20	5.15	5.35	8.56	2.76
<i>Mother HFA z-score</i>	-0.35	0.97	-0.80	1.01	-0.77	1.03	-0.68	1.06	-0.91	1.01	-0.66	0.98
<i>Mother Breastfeeds</i>	0.98	0.14	0.94	0.24	0.98	0.13	0.97	0.17	0.97	0.16	0.97	0.16
<i>Home delivery</i>	0.30	0.46	0.46	0.50	0.48	0.50	0.55	0.50	0.61	0.49	0.36	0.48
<i>Delivery Private facility</i>	0.01	0.08	0.04	0.19	0.08	0.26	0.11	0.31	0.13	0.34	0.02	0.15
<i>Delivery public health facility</i>	0.69	0.46	0.48	0.50	0.44	0.50	0.33	0.47	0.25	0.43	0.53	0.50
<i>Delivery other</i>	0.00	0.05	0.01	0.09	0.00	0.05	0.00	0.03	0.00	0.02	0.08	0.27

Source: Author's calculations based on data from various Demographic and health Surveys (2008-2013)

Table 4. 1: Sample characteristics by country (continued)

<i>Variable</i>	<i>BF</i>		<i>CI</i>		<i>GH</i>		<i>KE</i>		<i>NG</i>		<i>ZW</i>	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Pre-birth interval</i>	38.51	17.02	41.56	24.44	42.40	21.77	37.49	22.36	34.31	17.99	49.70	24.79
<i>Post birth interval</i>	31.34	8.71	29.15	9.07	30.86	9.41	26.65	9.44	27.78	8.78	32.05	10.94
<i>Baby postnatal check (2 months)</i>	0.83	0.38	0.70	0.46	0.62	0.49	0.61	0.49	0.30	0.46	0.58	0.49
<i>Attended antenatal checks</i>	0.96	0.20	0.90	0.30	0.97	0.18	0.92	0.27	0.68	0.47	0.92	0.27
<i>Father's Educ (yrs)</i>	1.35	3.08	3.17	4.47	6.22	5.16	7.74	4.24	6.88	5.62	9.33	3.00
<i>No. of wives</i>	1.32	0.59	1.20	0.46	1.11	0.33	1.10	0.34	1.20	0.45	1.05	0.28
<i>Wife rank</i>	1.17	0.44	1.11	0.34	1.06	0.24	1.05	0.24	1.09	0.32	1.03	0.20
<i>House hold size</i>	6.48	2.98	6.38	3.20	5.57	2.17	5.60	1.99	6.04	2.60	5.05	2.02
<i>Wealth index</i>	2.87	1.35	2.65	1.35	2.45	1.44	2.81	1.53	2.89	1.43	2.70	1.39
<i>Poorest --</i>	0.21	0.40	0.26	0.44	0.37	0.48	0.30	0.46	0.23	0.42	0.27	0.44
<i>Poor</i>	0.22	0.42	0.25	0.43	0.21	0.41	0.18	0.39	0.22	0.42	0.22	0.41
<i>Middle</i>	0.21	0.41	0.21	0.41	0.14	0.34	0.15	0.36	0.18	0.38	0.18	0.38
<i>Rich</i>	0.21	0.41	0.16	0.37	0.15	0.36	0.15	0.36	0.19	0.40	0.20	0.40
<i>Richest</i>	0.15	0.35	0.13	0.33	0.13	0.33	0.22	0.41	0.18	0.39	0.13	0.34
<i>Rural</i>	0.79	0.41	0.72	0.45	0.70	0.46	0.76	0.43	0.66	0.47	0.75	0.43

Source: Author's calculations based on data from various Demographic and health Surveys (2008-2013)

of the analysis, we re-scale the birth year by deducting 2000 to allow for variability in the year of birth.

Overall, there are slightly more boys than girls, with Ghana and La Cote d'Ivoire indicating even higher percentages of male children of 53 percent and 52 percent respectively²⁹. The birth order of approximately 60 percent of the children in the sample lies within the first three births for the pooled sample. Zimbabwe has the lowest average birth order of 2.6 while La Cote d'Ivoire has the highest of 3.7. Similarly, Zimbabwe has the smallest share (2%) of children born as part of a multiple set while in La Cote d'Ivoire about 5% of the children sampled were born as a multiple set.

As indicated, the mothers sampled are aged between 15 and 49 years with the average age ranging between 27 years for Zimbabwe and about 30 years for Ghana. On average, mothers from Zimbabwe and Kenya were more highly educated than average, compared with mothers from Burkina Faso and La Cote d'Ivoire who had on average one and 1.5 years respectively. Overall, there was a wide range of mothers' education ranging from none to 21 years across all six countries. Also approximately 47 percent of mothers had spent no time in school at all, a further twelve percent had incomplete primary education, while 14 percent had completed primary only. 17 percent had incomplete secondary education with only eight percent completing secondary school and about two percent having higher than secondary education.

In relation to the mothers' height-for-age (HFA), overall, about eleven percent of women were below two standard deviations from the mean HFA, 66 percent lay

²⁹ This is unusual and may either be the result of sampling or some girls are not reported. However, the survey report did not raise any of these issues, and the DHS survey is designed to avoid any biases in sampling.

between 2 standard deviations below the mean and the mean HFA, while the remaining 23 percent had HFAs above the mean. The country data show that of the six countries sampled, Nigerian and Ivoirian women have lower relative heights for their ages, compared with the other countries, while Burkinabe women are on average relatively taller for their ages

However, the negative average height-for-age shows that the majority of women in the sample are not well nourished, which has potential implications for the nutrition and survival of their children. The data also shows a high proportion of women breastfeed their children, ranging from 94 percent in La Cote d'Ivoire to 98 percent in Ghana.

The data further shows that home and public health facilities are the most popular places of delivery, accounting for approximately 92 percent of all births. Half of women, on average, give birth to their babies at home, ranging from 30 percent in Burkina Faso to 61 percent in Nigeria.

Another 42 percent, on average, deliver their babies in a public or government health facility, with proportions as high as 69 percent in Burkina Faso as opposed to only 25 percent of women in Nigeria. Less than four percent of women use private health facilities as a place of delivery, in Burkina Faso, La Cote d'Ivoire and Zimbabwe, while the use of private birth facilities is higher in Kenya (11%) and Nigeria (13%). Thus, it seems as if home delivery is most popular in Nigeria while delivery in a public health facility is more common practice in Burkina Faso. If these are also a reflection of the quality of care at birth, we will expect there to be higher rates of neonatal mortality in Nigeria, for example, compared with Burkina Faso.

The household characteristics indicate that the average household size in the sample is six while reported household size ranges from two to 36. There is very little variation in average household size across countries. Furthermore, monogamous households are in the majority with 83 percent of children born in monogamous households and the remaining 17 percent born into polygamous households. Of the latter, about 15 percent are from households where there are two wives. Households with more than two wives are less than one percent.

The households sampled are quite evenly distributed across the wealth quintiles with an average of 24 percent of the sampled households being categorised as poorest, while 22 percent were classified as poor. The middle, richer and richest households were 18 percent, 19 percent and 16 percent of the sample, respectively.

Fathers have on average higher levels of education (5.62 years) compared to mothers (4.35 years) as expected. There is a vast difference in the mean number of years of schooling among countries. Zimbabwe has the highest education levels for men (9.33) and women (8.56) years while Burkina Faso has the lowest for both men (1.35) and women (0.99) years of schooling.

4.3.2 Women's experience of domestic violence

The DHS module on domestic violence solicits responses from one woman of reproductive age selected at random from pre-selected households for the purposes of administering the domestic violence questionnaire. The woman is asked several questions pertaining to her experience of domestic violence by an intimate partner. The questions border both on whether she has ever experienced various forms of domestic

violence perpetrated by an intimate partner and if she has, its frequency over the preceding 12 months.

The ensuing analysis focuses on nine questions³⁰ asked in the domestic violence questionnaire in all six countries in this study. These include two questions on whether a woman has ever experienced emotional abuse, five on whether she has experienced physical abuse and two on sexual abuse. While information is collected on other forms of abuse, the analysis in this study is restricted to the nine questions. I focus on those nine questions because there are asked in all six countries, and allows for uniformity of our measures of DV across countries.

From the questions, three levels of domestic violence are identified namely: (i) emotional, (ii) physical abuse and (iii) sexual abuse. Women's responses to each category of questions are used to construct indicator variables for the purposes of this study. The indicator variable *emotional* involves whether a woman has been either (i) humiliated or (ii) threatened by her partner (questions a and b of DV04 in appendix 4, Figure A4.1). It takes the value 1 if a woman reports that she has experienced any of these forms of abuse and 0, otherwise. Similarly, the indicator variable *physical* involves whether a woman has been (i) pushed, shaken or having something thrown at the victim, (ii) slapped, or (iii) punched with the fist or hit with something harmful, (iv) kicked or dragged, or (v) being strangled or burnt (questions a to e of DV05 in appendix 4, Figure A4.1). *Physical* takes the value of 1 if the woman has experienced any one of these forms of abuse and 0, otherwise.

³⁰ Questions attached in appendix 4, Figure A4.1

Two aspects of sexual violence are included in the measure for sexual violence. They indicate whether the woman in question has been (i) forced into unwanted sex by her partner, or (ii) forced into unwanted sexual acts by her partner (questions h. and k. of DV05 in appendix 3, Figure A4. 1). The indicator variable, *Sexual* takes on a value of 1 if a woman reports having experienced at least one of these forms of sexual abuse, and 0, otherwise. Finally, a measure of domestic violence *Any_DV* is generated, taking the value one if the woman has suffered any form of violence, and zero otherwise.

While there are legitimate concerns regarding the quality of such sensitive data, due to potential under-reporting of domestic violence in surveys of this nature, DHS enumerators are trained to ensure that the highest quality of information is collected and thereby minimising the incidence of such under-reporting. First of all, enumerators are required to administer the questionnaires to a randomly selected woman in households selected for the administration of a domestic violence questionnaire in such a way that other members of the household will not be aware that a particular woman answered questions on domestic violence. Since it is administered as part of the women's module to all women of reproductive age. This helps to assure the respondent of anonymity.

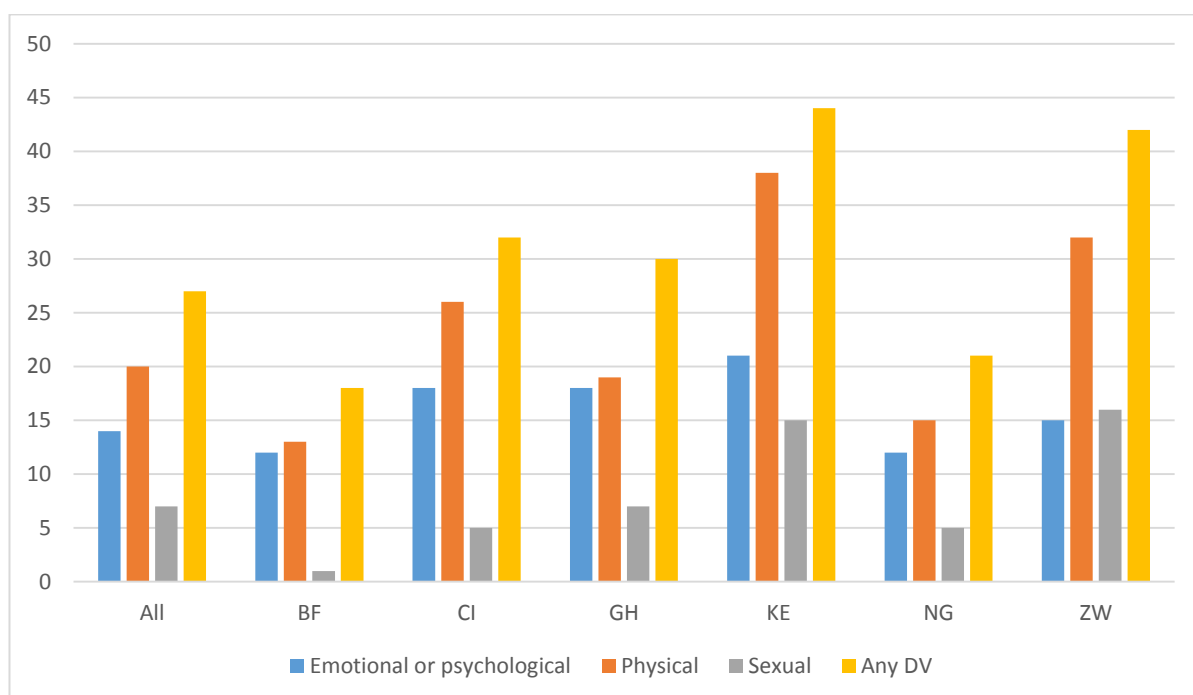
Second, enumerators are trained to ensure that there is complete privacy and confidentiality during the administration of the questionnaire through the use of filters. One of the first questions the module requires an enumerator to ask respondents is whether privacy is guaranteed before proceeding to administer the rest of the questions. Where privacy is not guaranteed prior to the administration of the module, enumerators are required to skip the section altogether. They are also required to

indicate whether privacy was disturbed during the course of the interview and the records are included in the data set.

Third, in order to elicit reliable responses, the questionnaire is designed using Conflict Tactics Scales (CTS) developed by Straus (1979, 1996). It thus begins with questions which respondents are likely to be most comfortable with and gradually extends to questions that are more likely to be uncomfortable to discuss. In this way, the enumerators gradually draw respondents' responses out without the inhibitions experienced if they were speaking to strangers they were uncomfortable with.

Despite these measures on the part of the enumerators, women's perceptions of violence and their willingness to report it may remain. For the avoidance of doubt, I examine the data further to determine whether there might be any biases in reporting. Figure 4.1 shows the incidence of intimate partner violence against women by country based on the definitions of domestic violence adopted in this study. The summary statistics show that on average 27 percent of all women sampled in the six countries surveyed reported experiencing at least one form of domestic violence. Across the six countries, the most common form of violence women reported was physical violence. Specifically, on average the proportion of women who reported experiencing physical violence perpetrated by their partners was 20 percent while those who reported experiencing emotional domestic violence was 14 percent. Seven percent of women on average reported being victims of sexual violence.

Figure 4. 1 : Incidence of domestic violence by country



Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013). *Incidence of domestic violence reported as percentages

At the country level, domestic violence reported by women is highest in Kenya and Zimbabwe with 44 and 42 percent of women, respectively, reporting that they had experienced at least one of the nine forms of violence from their partners³¹. This is followed by La Cote d'Ivoire and Ghana where 32 and 30 percent of women respectively report having experienced at least one form of violence from their partners. Of the six countries, women from Burkina Faso appear to have experienced the least violence (18 percent), followed by women from Nigeria (21 percent).

Considering the specific form of domestic violence experienced, again the incidence of emotional violence seemed highest among Kenyan women with 21 percent reporting having experienced emotional forms of domestic violence. This is followed by Ghana,

³¹see appendix 3 A3.1 for actual wording of the questions

and la Cote d'Ivoire where the incidence of emotional domestic violence is 18 percent, then Zimbabwe at 15 percent. Again, based on the data, women from Nigeria and Burkina Faso appear to have the least incidence (12 percent) of domestic violence relative to the other four countries. We thus observe that potentially, Burkina Faso and Nigeria may either have lower forms of domestic violence or that women may be under-reporting its incidence.

The data also shows that a relatively larger percentage of women on average reported experiencing physical abuse compared with women who reported experiencing emotional abuse.³² The percentage of women experiencing physical violence ranged between 13 percent of women (from Burkina Faso) and 38 percent of women (from Kenya). After Kenya, Zimbabwe and la Cote d'Ivoire have the next highest incidence of physical violence among the six countries in this study, with 32 percent and 26 percent respectively reporting having suffered physical abuse from their partners. The percentage of women who reported having ever experienced physical violence from their partner or partner were 19 percent for Ghana, and 15 percent for Nigeria.

Sexual violence is reported more rarely, with seven percent of women on average from all the countries in the study reporting that they had experienced sexual abuse from their partners. The data also suggests that sexual violence is almost non-existent in Burkina Faso, with one percent of women reporting having been sexually abused by their partners while the incidence of sexual violence is highest in Zimbabwe (16 percent) and Kenya (15 percent). On average, the incidence of sexual violence ranges between five and seven percent for la Cote d'Ivoire, Ghana and Nigeria respectively.

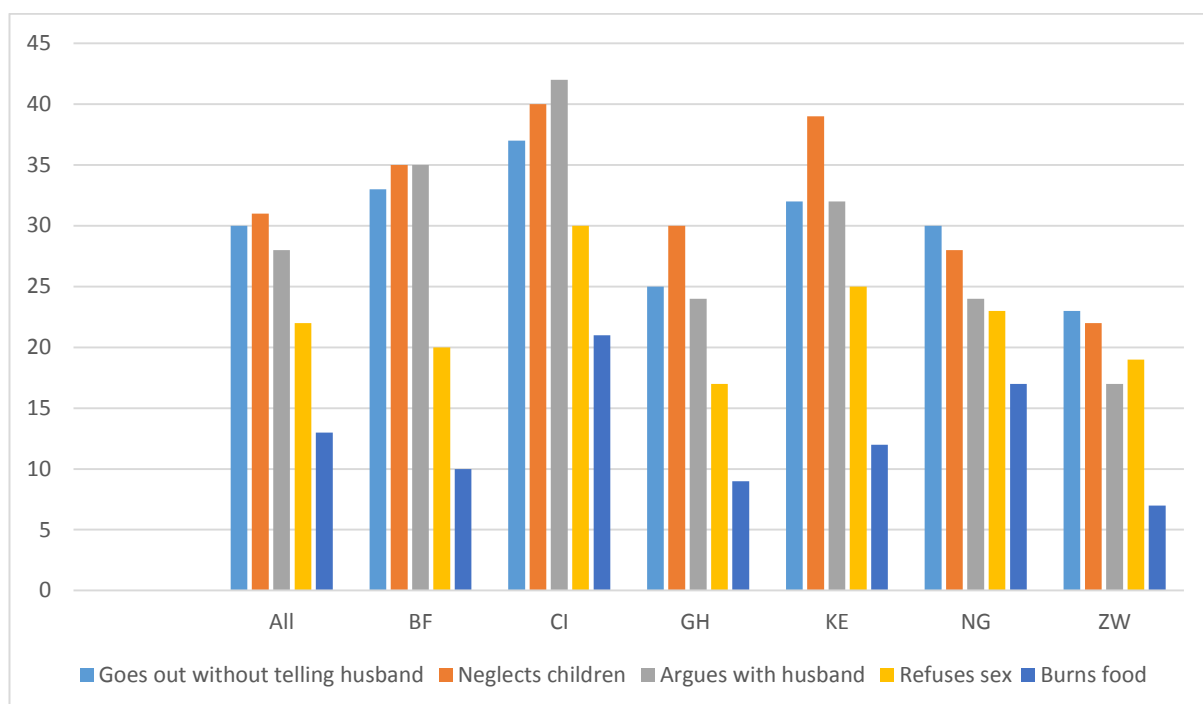
³² This may also be a reflection of the fact that this variable was constructed using the responses questions regarding five forms of abuse.

Thus, in summary, significant differences exist in women's experience of domestic violence among the six countries. A higher proportion of women from Kenya and Zimbabwe report experiencing domestic violence than the sample average. Women from Burkina Faso, and Nigeria, on the other hand, consistently report lower levels of domestic violence than average. The experience of violence reported by women from Ghana and La Cote d'Ivoire were nearer the average for the six countries.

These country level differences raise questions regarding the accuracy of women's reports of domestic violence in the survey and whether the data reflects the reality. For example, is there a systematic downward bias in women's reports of violence in Burkina Faso and Nigeria for example or is the lower incidence of domestic violence in Burkina Faso and Nigeria a reflection of its actual prevalence? To further investigate this, I compare the information on physical violence with women's perceptions about the justification of wife-beating by partners to determine whether there is an association between the incidence of physical violence reported and women's perceptions about the justification of wife-beating.

García-Moreno et al. (2005) report that women tend to be more accepting of domestic violence if they live in countries where it is highly prevalent. They also argue that, women who are victims of violence tend to be more accepting of domestic violence. Going by this argument, it would be expected that countries which have a higher score on the index, have higher prevalence of domestic violence relative to those with lower scores.

Figure 4. -2 : Percentage of women who perceive wife beating as justified, by country and reason



Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

Figure 4.2 shows the proportions of women who think wife beating is justified for various reasons. The reasons included in the survey were going out without telling her partner, neglecting her children, arguing with her partner, refusing sex, and burning food. On average about 31 percent of women in all six countries, thought wife beating was justified if women neglected their children, followed by 30 percent who thought it was justified for a woman to be beaten if she went out without telling her husband. Further, about 28 percent and 22 percent on average thought arguing with their partner and refusing sex respectively were reasons for which wife beating was justified. Only about 13 percent of women thought it was justified for a woman to be beaten if she burned the food.

In Table 4.2, the same data is presented with an additional column, which provides an index which measures on average, the number of reasons for which a woman thinks wife-beating is justified. This index is obtained from a sum of all the reasons for which a woman thinks a husband is justified in beating his partner. It thus has a minimum value of zero if no woman agrees that wife beating is justified for all of the reasons indicated, and a maximum of 5 if all women in the geographical jurisdiction under consideration, think wife beating is justified for all the five reasons listed. The country summary suggests that women from la Cote d'Ivoire are most accepting of Physical domestic violence with an average score of 1.69 out of a scale of 5. This is followed by women from Kenya (1.38), Burkina Faso (1.32), Nigeria (1.23), Ghana (1.04) and Zimbabwe (0.87) in that order. One will therefore expect that in the countries with high levels of tolerance, there might be a higher incidence of domestic violence.

When we consider the incidence of physical violence reported in figure 4.1, one finds that high levels of physical violence are reported by Kenyan women followed by Zimbabwean women then Ivoirian women, Ghanaian women and Nigerian and Burkinabe women respectively. The country summary suggests that women from la Cote d'Ivoire are most accepting of Physical domestic violence with an average score of 1.69 out of a scale of 5. This is followed by women from Kenya (1.38), Burkina Faso (1.32), Nigeria (1.23), Ghana (1.04) and Zimbabwe (0.87) in that order. One will therefore expect that in the countries with high levels of tolerance, there might be a higher incidence of domestic violence.

Table 4. 2: Percentage of women who perceive wife-beating as justified, by country and reason.

Country	<u>Reason for justification of wife beating</u>					<i>Number of reasons justified</i>
	<i>Goes out without telling husband</i>	<i>Neglects children</i>	<i>Argues with husband</i>	<i>Refuses sex</i>	<i>Burns food</i>	
<i>All</i>	30	31	28	22	13	1.24
<i>BF</i>	33	35	35	20	10	1.32
<i>CI</i>	37	40	42	30	21	1.69
<i>GH</i>	25	30	24	17	9	1.04
<i>KE</i>	32	39	32	25	12	1.38
<i>NG</i>	30	28	24	23	17	1.23
<i>ZW</i>	23	22	17	19	7	0.87

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

Indeed, one finds that, when the incidence of physical violence reported in figure 4.1 is considered, high levels of physical violence are reported by Kenyan women followed by Zimbabwean women then Ivoirian women, Ghanaian women and Nigerian and Burkinabe women respectively. This seems to suggest a relative under-reporting of women's experience of violence in La Cote d'Ivoire, Burkina Faso and Nigeria, compared with the other countries and raises questions regarding the accuracy of the domestic violence data.

I therefore explore next, at the country level, the correlations between women's perceptions on wife beating and their reported experience of the different types of violence to see if these are consistent. Women's perceptions of wife beating is measured using the index described earlier.

When the correlations between the incidence of domestic violence and women's acceptance of wife beating are examined (see Table 4.3), the correlations are weak for all types of domestic violence but strong for physical domestic violence. At the country level, we find a consistently significant and positive correlation between women's experience of physical violence and their reported experience of violence for all countries except Nigeria. The highest level of correlation, which is significant at the five percent level (0.14) is recorded for Ghana, followed by Zimbabwe (0.06) and Burkina Faso (0.03). The correlations for Kenya (0.05) and Cote d'Ivoire (0.04) are only significant at 10%.

Table 4. 3: Correlation between women's perceptions on wife beating and the incidence of domestic violence.

Country	<u>Type of violence</u>			
	<i>Emotional</i>	<i>Physical</i>	<i>Sexual</i>	<i>Any DV</i>
<i>Burkina Faso</i>	-0.0049	0.0324**	0.0170	0.0284*
<i>Cote D'Ivoire</i>	0.0737**	0.0443*	0.0382	0.0218
<i>Ghana</i>	0.0100	0.1356**	-0.0028	0.0862**
<i>Kenya</i>	-0.0305	0.0487*	0.0558**	0.0300
<i>Nigeria</i>	-0.0066	(-)0.0271**	0.0428*	(-)0.0296**
<i>Zimbabwe</i>	-0.0144	0.0574**	0.0256	0.0424**

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

* indicates significance at 10% and ** indicates significant at 5%

The consistently positive, although weak correlations between physical domestic violence and wife-beating for all countries except Nigeria raise questions about the Nigerian data. I further check to see if there might be any factors which characterise the sample of Nigerian women but are significantly different from women of other countries to explain the negative correlation.

The literature shows that factors such as differences in education, wealth, location, and socio-cultural norms are correlated with women's reported experience of violence. I first explore the incidence of domestic violence by location. Table 4.4, presents the percentage of women who suffer domestic abuse by rural and urban location for each country. The data again shows differences in the incidence of violence between urban and rural locations. In general, the incidence of domestic abuse is higher among rural women - by 14 percentage points and 8 percentage points - than urban women in Kenya and Zimbabwe respectively.

This disadvantage of rural women is consistent across all forms of violence. However, one observes an urban disadvantage for women living in Ghana (23% compared to 18% for rural women) in the case of physical abuse and sexual abuse (7% urban, 6% rural), and women from Nigeria in relation to emotional (14% urban, 11%, rural) and physical (16% urban, 15% rural) abuse. Similarly, urban women dwellers are more likely to experience domestic abuse in la Cote d'Ivoire than rural women are. In contrast, I find that women living in rural areas are more accepting of wife beating than those in urban areas (see appendix 4, Table A4.1).

This raises the question of whether these patterns signal the fact that increased awareness about domestic violence in the urban areas could result in lower levels of

Table 4. 4: Incidence of domestic violence by country and location (percent)

	<u>Emotional</u>		<u>Physical</u>		<u>Sexual</u>		<u>Any form</u>	
	<i>Rural</i>	<i>Urban</i>	<i>Rural</i>	<i>Urban</i>	<i>Rural</i>	<i>Urban</i>	<i>Rural</i>	<i>Urban</i>
<i>BF</i>	12	13	13	11	1	1	19	18
<i>CI</i>	16	21	25	28	5	5	30	36
<i>GH</i>	18	16	18	23	6	7	29	33
<i>KE</i>	22	18	42	26	16	13	48	34
<i>NG</i>	11	14	15	16	6	3	20	23
<i>ZW</i>	15	14	33	27	18	13	44	36

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

in rural and urban locations. The data seems to suggest significant differences exist for the sample of respondents in Burkina Faso otherwise it raises questions regarding the reliability of the Burkina Faso Data given that in all the other countries we observe significant rural-urban differences.

Next, I consider whether a woman's experience of physical violence may vary with household wealth or a woman's employment status as shown in Table 4.5. Once again, there are different patterns for each country, although the evidence of women's tolerance for wife-beating (see Appendix 4, A4.1) suggests that household wealth is negatively correlated with women's acceptance of violence across the board. Thus women from poorer households are more likely to be accepting of violence and by implication, they are more likely to be victims as well.

For Burkina Faso, the incidence of domestic violence is slightly higher among women from poorer households (20 percent), compared to women from richest households (17 percent). However, for Nigeria, the opposite is true. 15 percent of women from poorest households reported suffering violence from an intimate partner, whereas more than 22 percent of women from the wealthier quintiles suffered any violence. There does not seem to be much variation in the incidence of domestic violence among the various wealth quintiles for Ghana and la Cote d'Ivoire. There is however a marked increase in the incidence of violence among women from households in the middle and rich wealth quintiles, which is also true for Nigeria. For Kenya and Zimbabwe, the incidence of domestic violence among women from the four lower wealth quintiles is higher than among the richest.

Table 4. 5: Incidence of domestic violence by country and wealth quintile

Country	Type of Violence	Wealth Quintile					Employed	
		<u>Poorest</u>	<u>Poor</u>	<u>Middle</u>	<u>Rich</u>	<u>Richest</u>	<u>Yes</u>	<u>No</u>
Burkina Faso	<i>Emotional</i>	16	14	9	12	11	7	14
	<i>Physical</i>	13	14	14	11	11	10	13
	<i>Sexual</i>	1	1	1	2	1	1	1
	<i>Any form</i>	20	20	17	18	17	14	20
Cote d'Ivoire	<i>Emotional</i>	18	15	19	20	18	14	19
	<i>Physical</i>	26	24	25	30	24	27	25
	<i>Sexual</i>	4	6	6	2	6	5	5
	<i>Any form</i>	30	29	32	38	31	30	32
Ghana	<i>Emotional</i>	16	15	28	23	11	20	17
	<i>Physical</i>	22	13	23	20	20	19	19
	<i>Sexual</i>	6	6	10	3	9	2	7
	<i>Any form</i>	30	21	42	32	31	32	30
Kenya	<i>Emotional</i>	28	18	18	18	16	18	23
	<i>Physical</i>	47	37	48	37	21	36	39
	<i>Sexual</i>	17	16	20	11	10	13	17
	<i>Any form</i>	52	44	52	42	30	42	47
Nigeria	<i>Emotional</i>	9	13	14	14	13	9	14
	<i>Physical</i>	10	15	18	18	16	11	17
	<i>Sexual</i>	6	6	6	4	3	4	6
	<i>Any form</i>	15	22	24	26	22	16	24
Zimbabwe	<i>Emotional</i>	15	17	14	13	12	14	15
	<i>Physical</i>	33	35	34	32	19	31	33
	<i>Sexual</i>	17	21	18	14	12	15	20
	<i>Any form</i>	43	47	44	41	27	40	44

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

An examination of the distribution of women's perceptions on wife-beating for the pooled data, however shows clearly that women from poorer households and less educated women tend to be more tolerant of wife-beating and are therefore by implication also more likely to be victims of domestic violence.

The DHS data shows that, with the exception of Nigeria, the incidence of domestic violence is lowest among women from the wealthiest households; however, it appears that more women from households in the middle wealth quintiles report being victims of violence across all countries except Burkina Faso. From the above analysis therefore, women's report of domestic violence seems unusual in Nigeria and Burkina Faso.

The data also suggest a higher incidence of domestic violence among unemployed women in all countries. This is shown in the last two columns of Table 4.5. The table also shows that except for the incidence of physical and emotional violence among Ghanaian women being more or similar for working and non-working women, everywhere else there is a higher incidence of domestic violence among unemployed women than women in employment.

We also consider the patterns of domestic violence against women in relation to age (see Table 4.6) and educational attainment (see Table 4.7). There does not appear to be any significant associations between a woman's age and her experience of domestic violence across all countries, except for Nigeria where the incidence of violence tends to be higher among women from the older age group.

Table 4. 6: Incidence of domestic violence by age and country

Country	Type of Violence	Woman's Age						
		15-19	20-24	25-29	30-34	35-39	40-44	45-49
Burkina Faso	Emotional	9	12	14	12	11	17	12
	Physical	10	14	13	10	14	15	12
	Sexual	1	1	1	1	3	1	4
	Any form	13	19	20	16	18	24	14
Cote d'Ivoire	Emotional	16	18	19	14	18	23	23
	Physical	31	31	24	20	31	25	19
	Sexual	7	6	5	4	5	6	4
	Any form	36	33	32	26	36	35	27
Ghana	Emotional	0	21	17	16	22	17	4
	Physical	19	19	24	14	18	28	17
	Sexual	0	6	10	5	5	10	4
	Any form	19	30	32	27	32	40	17
Kenya	Emotional	21	19	20	24	17	31	14
	Physical	40	41	36	38	35	37	29
	Sexual	8	15	17	13	13	19	0
	Any form	48	46	44	43	43	49	29
Nigeria	Emotional	9	10	13	13	15	13	15
	Physical	10	12	16	17	15	18	25
	Sexual	6	5	5	5	5	5	8
	Any form	16	19	22	24	23	22	25
Zimbabwe	Emotional	13	14	13	14	20	17	25
	Physical	34	38	32	24	24	28	33
	Sexual	18	17	18	14	17	5	8
	Any form	43	47	42	35	39	31	42

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

Table 4. 7: Incidence of domestic violence by educational attainment and country

<i>Country</i>	<i>Type of Violence</i>	<i>None</i>	<i>Incomplete Primary</i>	<i>Complete primary</i>	<i>incomplete secondary</i>	<i>complete secondary</i>	<i>Higher</i>
Burkina Faso							
	<i>Emotional</i>	12	12	11	18	0	0
	<i>Physical</i>	13	16	10	9	0	0
	<i>Sexual</i>	1	2	0	1	17	0
	<i>Any form</i>	18	21	15	21	17	0
Cote d'Ivoire							
	<i>Emotional</i>	16	23	19	29	20	14
	<i>Physical</i>	25	29	31	25	30	14
	<i>Sexual</i>	5	5	9	4	0	0
	<i>Any form</i>	30	35	38	39	30	14
Ghana							
	<i>Emotional</i>	15	22	23	19	11	6
	<i>Physical</i>	20	30	15	14	11	6
	<i>Sexual</i>	3	11	6	9	0	6
	<i>Any form</i>	27	40	27	32	22	6
Kenya							
	<i>Emotional</i>	20	28	17	15	17	9
	<i>Physical</i>	39	49	34	46	19	8
	<i>Sexual</i>	12	19	14	18	12	8
	<i>Any form</i>	46	55	40	52	23	20
Nigeria							
	<i>Emotional</i>	7	20	17	21	14	12
	<i>Physical</i>	8	26	23	27	17	9
	<i>Sexual</i>	4	9	7	9	4	2
	<i>Any form</i>	13	34	31	36	24	19
Zimbabwe							
	<i>Emotional</i>	27	13	35	15	5	14
	<i>Physical</i>	36	36	36	30	14	19
	<i>Sexual</i>	18	15	20	16	19	14
	<i>Any form</i>	50	45	46	39	24	36

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013)

The data also shows that there is generally a lower incidence of domestic violence among women with at least some secondary levels of education, than among women with less than secondary level of education.

Therefore, to conclude, the descriptive analysis shows that while the incidence of domestic violence against women is varied across countries, it tends to be more widespread among -rural dwellers, women who are not employed, women with little education, and women from less wealthy households. There also remain some inconsistencies when it is viewed vis- a-vis the perceptions of women regarding wife beating. Burkina Faso and Nigeria have the most unusual patterns of the six countries.

Next, I analyse the sample characteristics descriptively by country beginning with the primary dependent variable of interest, infant mortality, then other child, maternal, household and community characteristics.

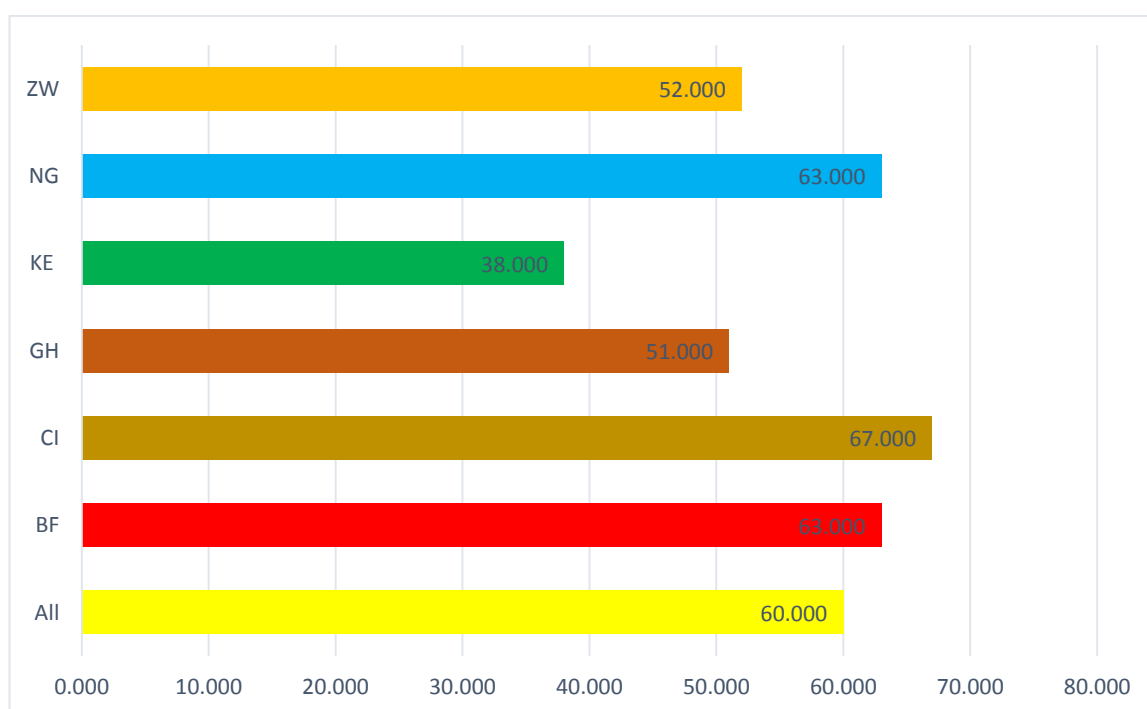
4.3.3 Infant mortality

By convention, infant mortality is defined as the number of children who die before their first birthday for every 1000 live births. However, for the purposes of this analysis, infant mortality is defined as a binary measure for each individual child. It is assigned the value 1 if a mother reports that a child born between one and five years before the survey, died before their first birthday, and zero otherwise. Children born in the twelve months before the survey are excluded from the analysis since they would not have reached their first birthday at the time of the survey.

Overall, the incidence of infant mortality is higher amongst boys and in rural households. The pooled sample average is 60 infant deaths per 1000 live births, but at

the country level, infant mortality ranges from 38 deaths per 1000 live births in Kenya, to 67 deaths per 1000 live births in La Cote d'Ivoire. The incidence of infant mortality by country is illustrated in Figure 4.3.

Figure 4. 3: Incidence of infant mortality by country



Source: Author's calculations based on data from various Demographic Health Surveys: Burkina Faso 2010-11 (BF), La Cote d'Ivoire, 2011-12 (CI), Ghana, 2008 (GH), Kenya, 2008-09 (KE), Nigeria, 2013 (NG), and Zimbabwe, 2010-11 (ZW)

A further inspection of the data reveals that in all of the six countries, with the exception of Burkina Faso and Kenya, the incidence of infant mortality is higher for boys than it is for girls with the most pronounced differences observed for Ghana and La Cote d'Ivoire. This is very much in contrast with data from Asia where a higher incidence of girl-child deaths are recorded.

4.4 Methodology

The empirical strategies employed for modelling the links between child mortality and domestic violence in this study are discussed in this section. The methodology draws primarily on the conceptual framework for analysing the effects of domestic violence (Yount et al, 2011) and the Mosley-Chen (1984) conceptual framework for modelling child health and mortality discussed in earlier chapters.

The Mosley-Chen (1984) framework has been adapted in several empirical studies for modelling child health outcomes from both a bio-medical and socio-economic perspective, attributing child survival to 'proximate' and 'socioeconomic' factors. Proximate factors are factors which lead to growth faltering, disease and death, while the latter include the individual, household and community socio-economic characteristics associated with child mortality. Socio-economic determinants affect child survival via the proximate determinants. Following Mosley-Chen (1984) and other empirical studies (such as Rawlings and Siddique, 20014), we account for maternal characteristics, household demographic, environmental and socio-economic factors, as well as location controls. Individual child characteristics are also controlled for.

Following Yount et al's (2011) framework highlighting direct and indirect links between a mother's experience of domestic violence and child health, this study adopts a methodology, which allows the estimation of both effects. Beginning with a basic model of child mortality to estimate the direct effects of a mother's experience of domestic violence on infant mortality, this sub-section further presents the methods for estimating the indirect effects of a mother's experience of domestic violence through mediating factors.

To capture the direct effects of a mother's exposure to domestic violence on infant mortality of the i th child born to mother j , ($InfM_{ij}$), the basic model is first estimated as shown in equation (4.1).

$$InfM_{ij} = \alpha + \beta DV_j + \delta_{ij} CNT_{ij} + \varepsilon_{ij}, \quad (4.1)$$

where DV_j measures the experience of domestic violence by mother j . It is a binary variable which takes on the value 1 if mother j has experienced domestic violence and 0, otherwise. CNT_{ij} are individual level proximate and socio-economic determinants of child mortality which are included as control variables. Based on the results of the likelihood ratio test, (Wooldridge and Greene 2002) the pooled model with country fixed effects is rejected in favour of separate country models as better fits for the data. Hence equation (4.1) is adapted to reflect this.

To control for maternal characteristics, her age, education, and height-for-age, breastfeeding practices and whether she works are included in the model. Household demographic and socioeconomic characteristics are controlled for by including the household wealth index, household size, father's education, number of other wives the husband has and the woman's rank among the wives. In addition, an indicator variable is included to account for whether or not the household is located in a rural area. Finally, the child's personal characteristics are included to control for their sex, birth order and whether they were born in a multiple set or not while controlling for their year of their birth.

Since infant mortality is a binary measure, logistic modelling techniques³³ are employed in the first stage of the analysis, which seeks to determine what the direct effects of a mother's experience of violence are on infant mortality.

Two-step modelling of the indirect effects of domestic violence on child mortality:

Further, following Baron and Kenny, (1986), a two-step modelling technique is employed to model the indirect effects of domestic violence through mediating factors. Several mediating variables were considered, but due to the limitations of quality data availability, this study limits the analysis to a woman's nutritional status, measured using her BMI, and her use of antenatal care during pregnancy.

Thus the mediating factor (MF_j) between the mortality of child i , and the experience of violence by mother j is first modelled as a function of its determinants (DT_j) and domestic violence (DV_j) as shown in equation (4.2):

$$MF_j = a + DT_j + DV_j + \varepsilon_j \quad (4.2)$$

In the second stage, using the fitted values of the mediating variable ($\widehat{MF_j}$), the determinants of mortality are estimated using equation (4.3), subject to the Baron and Kenny (1986) test³⁴.

³³ The preliminary stages of the analysis included the estimation of OLS regressions which were consistently similar to the Logistic regression results thus only the logistic regression results are reported.

³⁴ Going by this method, we expect the fitted values of the mediating factor (from the first stage regressions in which the experience of violence is statistically significant) to be statistically significant in explaining infant mortality. As a check, we further expect that when the domestic violence variable is included in equation 3.3, its coefficients will not be statistically significant.

$$InfM_{ij} = \kappa + \lambda \widehat{MF}_{Ij} + \varphi_{ij} CNT_{ij} + v_{ij} \quad (4.3)$$

We expect *a priori* that the experience of abuse will be associated with poorer outcomes of mediating factors, which, in turn, will be associated with higher likelihoods of infant mortality. In the next section, the determinants of mortality are modelled for individual countries.

4.5 Empirical Results

A Likelihood Ratio Test (see Wooldridge and Green, 2002) is conducted to determine beforehand whether a country level analysis provides a better fit for the data or a pooled sample with country fixed effects does. Next, a two-step modelling technique is used in order to estimate both the direct and indirect effects of domestic violence on infant mortality. This section reports the estimated results for a country level analysis after establishing, based on a Likelihood Ratio Test (see Wooldridge and Green, 2002), that a country level analysis provides a better fit for the data than a pooled sample with country fixed effects. Beginning with a logistic regression model for child mortality, the results of the direct impact of domestic violence on child mortality by country are reported. This is followed by an analysis of the effects of a woman's experience of violence on related maternal and child health factors which may mediate the effects of a mother's experience of violence and child survival.

4.5.1 Domestic violence and infant mortality

The estimated results of the baseline model for the determinants of infant mortality are presented in appendix 4 table A4 3.

This section however focuses on presenting and discussing the results of the associations between a mother's experience of emotional, physical or sexual violence and child mortality. Results are also presented for whether the mother was exposed to any of these three forms of violence. The discussion is focused on the analysis of the direct effects if any, followed by results of a two-stage analysis, which seeks to interrogate whether the effects of a mother's experience of domestic violence on infant mortality, is mediated by other factors.

i. Modelling the direct effects of DV on infant mortality

The country specifications show no significant direct correlations of a mother's experience of violence in any form with infant mortality, except in the case of Ghana as shown in Table 4.8. A look at the results for emotional, physical and sexual violence also only indicate significant associations between infant mortality and physical violence in Ghana, and infant mortality with emotional violence in Kenya. These results are summarised and presented in appendix Table A4.2, for emotional, physical and sexual violence respectively.

The results for the Ghanaian sample show that a woman's experience of physical violence and any form of violence are significantly positively associated with infant mortality. The odds of a child dying before their first birthday is 125 percentage points

(see Table A4.2 in appendix 4,) higher for mothers who had experienced physical violence and 99 percentage.

points higher if they reported experiencing any form of violence, holding all other factors constant. Similarly, the results for Kenya show that a mother's experience of emotional abuse is associated with higher odds of infant mortality. On average, children born to women who reported experiencing emotional abuse had a 99 percentage points increased odds of dying before their first birthday.

These results provide limited evidence on the direct effects of DV on infant mortality in the countries included in this study. However, the conceptual framework of Yount et al (2011) suggests that the effects of a mother's experience of DV may affect a child's health through various intermediary channels. These are examined next.

ii. Modelling the indirect effects of DV on infant mortality

In this section, the mediating factors between a mother's experience of violence and infant mortality are explored. A much smaller sample size is used in the analysis as it seeks to focus on the most recent child born to a woman to make it possible to draw comparisons with the analysis for a mother's use of antenatal care.

Table 4. 8: Direct Effects of Domestic Violence on infant mortality

VARIABLES	(1) BF	(2) CI	(3) GH	(4) KE	(5) NG	(6) ZW
Male child	1.04 (0.136)	1.83*** (0.422)	1.77* (0.609)	1.07 (0.370)	1.21* (0.119)	1.08 (0.239)
Birth order number	1.07 (0.064)	1.04 (0.090)	1.07 (0.138)	0.96 (0.154)	1.18*** (0.042)	1.32** (0.165)
Born as multiple set	6.12*** (1.360)	3.20*** (1.134)	3.32** (1.803)	4.83** (3.611)	4.02*** (0.808)	4.12*** (2.031)
Low birthweight	1.54*** (0.256)	1.52 (0.430)	1.47 (0.597)	1.64 (0.719)	1.47*** (0.184)	1.76* (0.509)
Year of birth	0.91* (0.046)	1.03 (0.088)	0.99 (0.115)	0.97 (0.121)	0.92** (0.032)	1.00 (0.082)
Mother's current age	0.97 (0.019)	1.01 (0.029)	1.04 (0.040)	1.01 (0.046)	1.01 (0.013)	0.97 (0.031)
Mother's education (years)	1.00 (0.037)	0.92 (0.057)	1.06 (0.058)	1.07 (0.068)	0.94*** (0.015)	0.97 (0.047)
Mother's Height-for-age (z)	0.85** (0.058)	0.93 (0.105)	1.06 (0.173)	0.81 (0.136)	0.94 (0.046)	0.92 (0.104)
Rural	1.01 (0.224)	1.21 (0.464)	0.97 (0.511)	0.89 (0.568)	0.96 (0.134)	1.26 (0.461)
Breastfeeding mother	0.09*** (0.022)	0.07*** (0.019)	0.02*** (0.013)	0.01*** (0.006)	0.03*** (0.005)	0.02*** (0.007)
Home Delivery = 0	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)
Public/Govt facility Delivery	0.77* (0.119)	0.58** (0.151)	0.73 (0.294)	0.75 (0.328)	0.69** (0.103)	0.95 (0.242)

Table continued on next page

Table 4.8: Direct Effects of Domestic Violence on infant mortality (continued)

VARIABLES	(1) BF	(2) CI	(3) GH	(4) KE	(5) NG	(6) ZW
<i>Private facility Delivery</i>	1.00 (0.000)	1.23 (0.735)	0.82 (0.585)	1.72 (0.991)	1.00 (0.180)	1.00 (0.000)
<i>Other place of Delivery</i>	3.75** (2.211)	0.57 (0.604)	6.09** (5.326)	33.52*** (32.883)	6.89*** (1.833)	0.86 (0.388)
<i>Man's Education (years)</i>	0.98 (0.029)	0.95 (0.033)	0.92* (0.043)	0.93 (0.053)	1.03** (0.013)	1.00 (0.045)
<i>Number of other wives/partners</i>	1.94*** (0.347)	1.37 (0.411)	2.34 (1.340)	1.25 (0.776)	2.29*** (0.328)	1.44 (0.578)
<i>Respondent's rank among wives</i>	1.35 (0.272)	0.89 (0.369)	0.47 (0.434)	1.18 (0.979)	0.89 (0.174)	1.90 (1.054)
<i>Number of household members</i>	0.82*** (0.030)	0.90** (0.044)	0.85* (0.082)	0.77** (0.097)	0.70*** (0.022)	0.79*** (0.057)
<i>Wealth index = 2, Poorer</i>	1.45* (0.279)	0.95 (0.301)	0.56 (0.317)	1.60 (0.876)	1.06 (0.147)	1.32 (0.414)
<i>Wealth index = 3, Middle</i>	1.22 (0.252)	0.88 (0.301)	0.93 (0.561)	1.59 (0.927)	0.86 (0.147)	1.12 (0.398)
<i>Wealth index = 4, Richer</i>	1.01 (0.223)	1.92 (0.804)	1.34 (0.913)	1.24 (0.775)	0.92 (0.186)	1.78 (0.707)
<i>Wealth index = 5, Richest</i>	0.84 (0.280)	0.96 (0.574)	1.07 (0.932)	0.71 (0.649)	0.76 (0.202)	0.72 (0.429)
<i>Any Domestic Violence</i>	1.11 (0.182)	1.28 (0.298)	1.99** (0.667)	1.60 (0.575)	1.01 (0.123)	0.87 (0.198)
<i>Constant</i>	2.34 (1.372)	0.51 (0.579)	3.39 (5.295)	3.35 (5.182)	12.44*** (6.471)	1.61 (1.914)
<i>Observations</i>	4,358	1,591	991	1,366	8,580	2,178

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, Standard errors in parentheses (exponents of logistic coefficients reported)

The ensuing analysis focuses on the more general measure of domestic violence, which measures whether a mother has experienced any of the three forms of domestic violence. This part of the study focuses on the nutritional status of the mother, measured by her BMI, and her use of antenatal care during pregnancy as mediating factors. Next, I report the results for mother's BMI and a mother's use of antenatal services as intermediaries through which the effects of a mother's experience of violence might affect infant mortality.

Table 4.9 presents the results of OLS regressions of mothers BMI. The estimated coefficients of domestic violence, which is our variable of interest, are statistically significant at 5% for La Cote d'Ivoire, and 10% for Nigeria and Zimbabwe. They also indicate a negative association between a mother's nutrition and her experience of violence, as expected *a priori*. Specifically, in La Cote d'Ivoire, a mother's experience of violence is associated with a 0.42 fall in her BMI, while for Nigeria and Zimbabwe, the experience of violence by a mother is associated respectively with a 19 and 29 drop in BMI. These results suggest that the mothers BMI could potentially mediate the effects of her experience of violence on infant mortality. I therefore proceed next to the second stage and apply the Baron and Kenny, (1986) test.

Table 4. 9: OLS Estimates of the Effects of Any DV on Mother's BMI

VARIABLES	BF	CI	GH	KE	NG	ZW
General Domestic violence	-0.07 (0.106)	-0.42** (0.183)	0.03 (0.249)	0.06 (0.201)	-0.19* (0.105)	-0.29* (0.159)
Mother's age (years)	0.03 (0.032)	0.18*** (0.061)	0.49*** (0.089)	0.28*** (0.079)	0.23*** (0.035)	0.27*** (0.062)
Mother age squared	-0.00 (0.001)	-0.00* (0.002)	-0.01*** (0.002)	-0.00* (0.002)	-0.00** (0.001)	-0.00** (0.002)
Mother's education (years)	0.14*** (0.020)	0.14*** (0.032)	0.05 (0.032)	0.16*** (0.029)	0.14*** (0.012)	0.14*** (0.034)
Mother is currently pregnant	0.61*** (0.133)	1.39*** (0.253)	0.58 (0.404)	1.19*** (0.315)	1.05*** (0.120)	1.45*** (0.264)
Mother works	0.11 (0.110)	0.48** (0.214)	0.65* (0.389)	0.10 (0.205)	-0.02 (0.097)	-0.04 (0.161)
Sex of household head	-0.07 (0.580)	0.92 (0.786)	-0.06 (0.710)	0.14 (0.512)	0.44 (0.352)	-0.11 (0.206)

Table continued on the next page

Table 4.9: OLS Estimates of the Effects of Any DV on Mother's BMI (continued)

VARIABLES	BF	CI	GH	KE	NG	ZW
<i>Number of household members</i>	-0.03 (0.023)	0.03 (0.031)	-0.05 (0.070)	0.16** (0.073)	0.02 (0.024)	-0.05 (0.044)
<i>Total children ever born</i>	0.12** (0.055)	-0.03 (0.093)	-0.43*** (0.143)	-0.24* (0.129)	-0.09* (0.052)	0.17 (0.126)
<i>Births in last five years</i>	-0.15* (0.083)	0.13 (0.159)	0.81*** (0.222)	0.01 (0.177)	0.17** (0.078)	0.05 (0.171)
<i>Age of woman at 1st birth (years)</i>	0.01 (0.023)	-0.08** (0.036)	-0.15*** (0.050)	-0.06 (0.048)	-0.08*** (0.021)	-0.11*** (0.041)
<i>Number of other wives/partners</i>	0.03 (0.101)	-0.31 (0.200)	-0.13 (0.383)	-0.06 (0.283)	-0.22* (0.119)	-0.91*** (0.279)
<i>Richest Household</i>	2.22*** (0.183)	-	4.09*** (0.554)	1.25*** (0.453)	2.74*** (0.207)	1.94*** (0.345)

Table continued on the next page

Table 4.9: OLS Estimates of the Effects of Any DV on Mother's BMI (continued)

VARIABLES	BF	CI	GH	KE	NG	ZW
<i>Rich Household</i>	0.74*** (0.132)	-1.31*** (0.335)	2.06*** (0.446)	0.45 (0.356)	1.27*** (0.166)	0.56* (0.286)
<i>Middle household</i>	0.36*** (0.128)	-1.81*** (0.360)	0.92** (0.401)	- (0.147)	0.64*** (0.147)	0.14 (0.248)
<i>Poor Household</i>	0.45*** (0.125)	-1.94*** (0.399)	0.99*** (0.321)	-0.46 (0.332)	0.18 (0.129)	-
<i>Poorest Household</i>	- (0.410)	-2.34*** (0.410)	- (0.314)	-1.63*** (0.314)	-	-1.40*** (0.224)
<i>Urban residence</i>	0.56*** (0.130)	1.22*** (0.283)	1.20*** (0.350)	0.84** (0.359)	-0.23* (0.116)	0.63** (0.252)
<i>Constant</i>	19.78*** (0.704)	22.15*** (1.096)	19.18*** (1.229)	19.32*** (1.030)	19.99*** (0.514)	21.55*** (0.764)
<i>Observations</i>	2,916	1,063	457	870	5,298	1,706
<i>R-squared</i>	0.136	0.161	0.268	0.236	0.169	0.175
***	p<0.01,	**	p<0.05,	*	p<0.1,	OLS
						estimates;
						Standard
						errors
						in
						parentheses

Since the coefficient of domestic violence is statistically significant in explaining a mother's BMI for La Cote d'Ivoire, Nigeria and Zimbabwe in this stage, the predicted values of BMI are included in the estimation of infant mortality regression as previously indicated in equation (4.3) for these three countries only. The results are presented in Table 4.10. Here infant mortality (U1M) is the dependent variable while the explanatory variable of interest is predicted value of BMI. We however note that child characteristics, and to some extent, household wealth are statistically significant determinants of infant mortality as previously found. Of greater interest however, are the coefficients of the fitted values of mother's BMI. The results for La Cote d'Ivoire suggest that the predicted BMI values of the mother, has no significant effect on infant mortality. This indicates that for that sample, a mother's nutrition status may not mediate the effects of domestic violence on infant mortality although a mother's nutrition status is impacted by her experience of domestic violence.

Further, the results for Nigeria and Zimbabwe, are counter-intuitive as they are significant but, contrary to expectation, indicate a positive association between infant mortality and predicted mother's BMI. Specifically, a unit increase in the z score of the predicted mother's mean BMI is associated with a 0.4 increase in the probability of (corresponding to a 1.23 increase in the z score of) infant mortality for Nigeria and 0.42 increase in the probability of (corresponding to a 1.38 increase in the z score of) infant mortality for Zimbabwe.

Table 4. 10: Second stage: Effects of DV on infant mortality through Mother's (BMI)

	<i>CI</i>	<i>NG</i>	<i>ZW</i>
<i>VARIABLES</i>	<i>U1M</i>	<i>U1M</i>	<i>U1M</i>
<i>Male child</i>	1.27* (0.180)	1.11* (0.069)	1.11 (0.140)
<i>Birth order number</i>	0.96 (0.047)	0.96* (0.021)	1.00 (0.067)
<i>Born as multiple set</i>	2.85*** (0.769)	3.01*** (0.482)	3.23*** (0.991)
<i>Year of birth</i>	1.16** (0.075)	1.11*** (0.032)	1.24*** (0.071)
<i>Wealth index = 2, Poorer</i>	0.77 (0.157)	1.03 (0.094)	0.65* (0.151)
<i>Wealth index = 3, Middle</i>	0.89 (0.196)	0.87 (0.101)	0.63* (0.167)
<i>Wealth index = 4, Richer</i>	0.82 (0.232)	0.69** (0.104)	0.83 (0.226)
<i>Wealth index = 5, Richest</i>	0.55 (0.251)	0.45*** (0.106)	0.34** (0.149)
<i>Mothers age (yrs)</i>	1.01 (0.017)	0.99 (0.010)	0.98 (0.019)
<i>Mothers education (yrs)</i>	0.95 (0.031)	0.97*** (0.011)	0.91*** (0.026)
<i>Number of other wives/partners</i>	1.30 (0.235)	1.04 (0.103)	1.59 (0.488)
<i>Respondent's rank among wives</i>	0.71 (0.196)	1.03 (0.138)	1.03 (0.445)
<i>Rural</i>	0.88 (0.223)	1.01 (0.088)	1.23 (0.267)
<i>Fitted values (BMI)</i>	1.04 (0.115)	1.23*** (0.080)	1.38*** (0.151)
<i>Constant</i>	0.03 (0.069)	0.00*** (0.001)	0.00*** (0.000)
<i>Observations</i>	1,063	5,298	1,706

Probit estimates, Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Given these counter-intuitive results, different variants of the two-stage model with mothers BMI as a mediating factor are estimated using the more specific types of domestic violence, but while there are marginal changes in the size of the coefficients the signs remain the same. Consequently, the mediating effects of a mother's nutrition status is inconclusive and requires further study. Similarly, regressions using the z scores of the height-for-age of the mother (not reported) did not suggest that a mother's height-for-age mediated the possible effects of domestic violence experienced by the mother on infant mortality.

Next, I consider whether a mother's use of antenatal care may mediate the effects of domestic violence on infant mortality. From the DHS data, the Antenatal variable is generated, which takes on the value of 1 if a woman reports that she did seek antenatal care at least once during her most recent pregnancy, and 0, otherwise. Probit regressions are estimated in the first stage to determine the effects of domestic violence on a woman's use of antenatal care during pregnancy.

The country-by-country results presented in Table 4.11 show that it is only in La Cote d'Ivoire and Nigeria that a woman's use of antenatal care is significantly affected by her experience of violence. We however find different effects of a mother's exposure to domestic violence and her use of antenatal care in these two countries. The association is positive for Nigeria but negative for la Cote d'Ivoire. For la Cote d'Ivoire, holding all other things equal, the probability of a woman seeking antenatal care during pregnancy is 0.22 or 22 percent lower than that of a non-abused woman whereas for Nigeria there is a 0.16 or 16 percent increased probability of seeking antenatal care among abused women who are pregnant, compared with non-abused pregnant

Table 4. 11: Effects of a Mother's experience of any DV on her use of antenatal care

VARIABLES	Antenatal BF	Antenatal CI	Antenatal GH	Antenatal KE	Antenatal NG	Antenatal ZW
General Domestic violence	0.94 (0.104)	0.68*** (0.085)	0.96 (0.242)	0.92 (0.138)	1.16*** (0.062)	1.04 (0.099)
Mothers age (yrs)	0.95 (0.032)	1.05 (0.042)	1.18** (0.092)	1.10* (0.057)	1.03* (0.016)	1.11*** (0.037)
Mothers age_sq	1.00 (0.001)	1.00 (0.001)	1.00* (0.002)	1.00** (0.001)	1.00 (0.000)	1.00* (0.001)
Mothers education (yrs)	1.02 (0.033)	1.17*** (0.050)	1.06 (0.045)	1.12*** (0.027)	1.08*** (0.006)	1.03 (0.021)
Mother works	1.39*** (0.152)	1.30* (0.190)	0.96 (0.382)	1.07 (0.174)	1.26*** (0.058)	0.98 (0.096)
Sex of household head = 0,	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	0.94 (0.316)	1.04 (0.190)	0.99 (0.119)
Number of household members	1.02 (0.026)	0.98 (0.019)	0.94 (0.054)	0.96 (0.050)	1.00 (0.011)	0.97 (0.024)
Total children ever born	0.95 (0.052)	0.90* (0.056)	0.88 (0.121)	0.96 (0.083)	0.96 (0.024)	0.87** (0.062)
Births in last five years	0.99 (0.087)	0.98 (0.111)	0.87 (0.185)	0.95 (0.120)	1.02 (0.039)	0.82* (0.086)
Age of respondent at 1st birth	1.02 (0.024)	0.97 (0.026)	0.99 (0.055)	0.98 (0.035)	1.02* (0.010)	0.99 (0.025)

Probit regression of Antenatal, Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.11: Effects of a Mother's experience of any DV on her use of antenatal care (continued)

VARIABLES	Antenatal BF	Antenatal CI	Antenatal GH	Antenatal KE	Antenatal NG	Antenatal ZW
<i>Number of other wives/partners</i>	0.84 (0.091)	0.78** (0.095)	0.86 (0.234)	0.61*** (0.097)	0.92 (0.051)	0.53*** (0.074)
<i>Richest Household</i>	3.34*** (0.967)	1.57 (0.609)	1.00 (0.000)	1.48 (0.619)	2.82*** (0.319)	1.19 (0.260)
<i>Rich Household</i>	2.31*** (0.356)	2.42*** (0.628)	1.00 (0.000)	1.63 (0.485)	2.26*** (0.177)	1.08 (0.192)
<i>Middle household</i>	1.59*** (0.195)	1.67*** (0.283)	1.64 (0.792)	1.36 (0.314)	1.95*** (0.126)	0.86 (0.125)
<i>Poor Household</i>	1.36*** (0.152)	1.71*** (0.259)	1.18 (0.313)	1.25 (0.261)	1.40*** (0.077)	0.91 (0.125)
<i>Poorest Household = o,</i>	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)
<i>Urban residence</i>	1.01 (0.162)	2.07** (0.598)	1.10 (0.532)	1.27 (0.430)	1.59*** (0.096)	0.63*** (0.095)
<i>Constant</i>	2.95*** (1.233)	3.22** (1.542)	3.46 (3.387)	2.76 (1.985)	0.35*** (0.089)	4.43*** (2.040)
<i>Observations</i>	2,916	1,063	457	870	5,298	1,706
<i>Probit regression of Antenatal, Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1</i>						

women. Although contradictory, these results again reflect country level differences in women's behaviour when it comes to exposure to domestic violence. It is also worth noting that differences in mother's responses are possible as studies such as Hindin et al, (2008) have shown that it is possible for women's use of antenatal care to increase or decrease due to domestic violence as observed in different studies. They show among other things

Table 4. 12: Effects of DV on infant mortality through Mother's antenatal use

VARIABLES	CI U1M	NG U1M
Male child	1.25 (0.179)	1.11* (0.069)
Birth order number	0.97 (0.048)	0.98 (0.022)
Born as multiple set	2.87*** (0.781)	2.89*** (0.461)
Year of birth	1.14** (0.071)	1.07** (0.029)
Wealth index = 2, Poorer	0.77 (0.184)	1.01 (0.120)
Wealth index = 3, Middle	0.89 (0.220)	0.89 (0.161)
Wealth index = 4, Richer	0.84 (0.255)	0.79 (0.161)
Wealth index = 5, Richest	0.53 (0.206)	0.69* (0.147)
Mothers age (yrs)	1.02 (0.017)	1.01 (0.008)
Mothers education (yrs)	0.96 (0.032)	0.98 (0.014)
Number of other wives/partners	1.29 (0.244)	1.01 (0.100)
Respondent's rank among wives	0.72 (0.200)	1.02 (0.136)
Mother's Height for Age (z)	0.99 (0.071)	0.98 (0.031)
Rural	0.86 (0.201)	1.09 (0.113)
Pr(Antenatal)	1.30 (1.613)	1.66 (0.863)
Constant	0.06** (0.074)	0.06*** (0.025)
Observations	1,063	5,298

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

that there is a more frequent use of antenatal care among ever beaten women, but less likelihood of using skilled care within the first 3 months of pregnancy for women exposed to domestic violence.

I proceed to analyse the second stage regressions for La Cote d'Ivoire and Nigeria since they were the only countries for which domestic violence is shown to have a significant effect on a woman's use of antenatal care.

It is expected that if a mother's use of antenatal care mediates the effects of domestic violence on child mortality, the coefficients of the predicted values of a mother's use of antenatal care during pregnancy will be statistically significant in the infant mortality regression. Table 4.12 show the results of the second stage regressions, for both countries. The coefficients of the predicted values of a mother's use of antenatal care during pregnancy are not statistically significant. From these results, there is no evidence that a mother's use of antenatal care during pregnancy mediates the possible effects of a mothers reported exposure to domestic violence on infant mortality for La Cote d'Ivoire and Nigeria even when different variants of the infant mortality model are estimated. This implies that a mother's use of antenatal care may not mediate the effects of her experience of domestic violence on children's survival in both countries.

Further checks on whether the birthweight of a child or the mother's use of postnatal checks might mediate the domestic violence infant mortality relationship (results not reported here), found no such effects. I therefore conclude that for the countries studied, there is no consistent evidence of the mediating effects of a mother's domestic violence through her nutrition or her use of antenatal care on child mortality. This implies that for our six country sample, the effects of a mother's experience of domestic

violence on infant mortality, if any, are not mediated by the maternal factors investigated nor are they mediated by the child's birthweight.

Returning to the literature on the determinants of infant mortality, factors known to affect infant mortality are classified into maternal, nutrition, disease, injury and environmental factors (UN, 1990). Due to the constraints imposed by the data available, even though it may have been interesting to study how these other factors might possibly mediate the effects of domestic violence on infant mortality it has not been possible to do so. This has constrained the current study to exploring only the possible maternal mediators of domestic violence on infant mortality. Given these findings, I turn next to consider how these results compare with other studies.

4.5.2 How are these results related to other studies?

First, our analyses suggest that the use of country-specific analysis was a better approach to determining the effects of a woman's exposure to domestic violence on child survival. In that respect our approach differs from Rawlings and Siddique (2014) but is similar to Rico et al (2011), Kishor and Bradley (2012) and Odimegwu et al (2014). I therefore suggest that whereas studies based on pooled data sets may have their place in the literature, in the understanding of the effects of women's experience of violence, there is also the need to consider a more "close-up" view at the country level since not all the variations between countries are adequately accounted for by country fixed effects. For example, whereas we find that a mother's exposure to physical violence is associated with infant mortality in Ghana, the same does not hold for neighbouring Burkina Faso or La Cote d'Ivoire. In this regard, the current study provides additional insights beyond those provided by Rawlings and Siddique (2014).

The current study comes closest to three others that use DHS data but adopt a country-specific approach to their analysis. Although the dependent variables of interest in each study differs, we find no contradictions between the current study and studies by Rico et al (2011), Kishor and Bradley, (2012), and Odimegwu et al (2014) who use DHS data from various African countries four of which are included in the current study.

Odimegwu et al (2014) for example used multiple logistic regression analysis to explore the effects of a mother's experience of emotional, sexual and physical violence on child health in three countries- Burkina Faso, Cameroon, and Zimbabwe. In their study, they only found evidence of a positive association between a woman's exposure to physical violence and under-five mortality but a negative association between a woman's experience of sexual violence and under five mortality for Cameroon. They did not find statistically significant associations between any of the three forms of domestic violence and under five mortality for Burkina Faso or Zimbabwe. Similarly, the current study finds no such associations between infant mortality and women's exposure to violence in these two countries.

In the study by Rico et al (2011), which also used multiple logistic regressions for the analysis, it was only for Kenya and marginally, for Malawi that evidence was found between intimate partner violence and child under two mortality. For Kenya, a woman's experience of Physical violence increased the odds of under-two mortality by 1.42 while in Malawi, a woman's experience of sexual violence increased the odds of under-two mortality by 1.12. No statistically significant associations were found for Egypt or Rwanda, the two other African countries included in the study.

On the other hand, Kishor and Bradely (2012) do find evidence of a positive association between a woman's exposure to domestic violence and having a child who died. Even though their definition of child mortality is rather broad compared with the current study.

Therefore, to conclude, we set out at the beginning of this section to determine whether a mother's experience of domestic violence has any direct or indirect effects on child survival focusing on infant mortality.

In relation to infant mortality, there is no consistent evidence of the direct or indirect effects of a mother's experience of violence on infant mortality across countries except for Ghana and Kenya where a woman's reported exposure to physical and emotional violence respectively seem to matter for infant mortality.

4.6 Conclusion

This study set out to examine the effects of a mother's experience of domestic violence on child survival for six Sub-Saharan African countries with a focus on infant mortality.

The key findings with regards to the determinants of infant mortality, indicate that consistent with the literature, while household, maternal, and individual level characteristics matter in explaining why a child may die before their first birthday, the importance of these factors in explaining infant mortality differs from country to country. What the results consistently show for all countries however, is the importance of individual child characteristics in infant survival. The results show that male children, children born with low birthweight and those born as part of a multiple set are also very prone to dying before their first birthday. In addition, on the part of the mother, their

choice to breastfeed and the choice of having their babies in a public health facility, reduce infant mortality. We find that children born to breastfeeding mothers are between 91 to 99 percent more likely to survive than children who are not breastfeed. Children born in public health facilities have between a 27 and 42 percent higher chances of surviving than those born at home. Finally, we find that the likelihood of children dying before their first birthday reduces with increasing household size. However, for Burkina Faso and Nigeria, polygamous households are associated with higher likelihoods of infant mortality.

Turning one's attention to the effects of domestic violence on infant mortality, we only find direct effects of a mother's experience of domestic violence in Ghana. I also find for Kenya that women who reported experiencing emotional violence were more likely to have lost their child before they reached their first birthday. From the two-stage analysis, I find no consistent evidence that the effects of a woman's experience of domestic violence on child mortality is mediated by her nutrition or her use of antenatal care during pregnancy.

Although these results seem somewhat mixed, they conform with the findings of earlier studies (see Rico et al, 2011, Odimegwu et al, 2014) who point to physical and sexual violence being important determinants of under-two and under-five mortality respectively, in some but not all sub-Saharan African countries included in their studies. In this study, I find that these results hold to varying extents for Ghana and Kenya.

In terms of policy, these findings suggest that maternal exposure to domestic violence remains a potential threat to child survival and continued societal education and re-orientation is required to address its prevalence in the sub-region. This calls for further

understanding of the characteristics and risk factors for women with young children who experience violence. It will also be useful for health practitioners who interact with women before, during and after delivery to be trained to identify and support women at risk of domestic violence. Women should be encouraged to be more open about their experiences of domestic violence, which should also be accompanied by the assurances of support should they do so. In this regard, more resources should be channelled into strengthening the health and law enforcing institutions to enable them to identify and provide such support to mothers of young children

This study however has its limitations. First, the key findings are based on the assumption that the experience of violence reported by the mother is associated with the infancy of the child under study. This may however not be the case since the measure of domestic violence is based on whether a woman reports that she has "*ever*" experienced domestic violence. Even though the follow-up question, when the woman answers in the affirmative, gives an indication of its frequency over the twelve months preceding the survey, it is not guaranteed that the reported violence coincided with the pregnancies or infancies of the children sampled.

Second, although ICF Macro, ensures that women are guaranteed the utmost privacy when enumerators are administering the domestic violence module, there is still the possibility of measurement error of domestic violence. This may result from the under-reporting of domestic violence by women whose traditional and cultural norms may be accepting of the practice as indicated by Cocker-Appiah and Cusack (1999) for Ghana. The discrepancies between women's perceptions on wife-beating and their reported experience of domestic violence discussed in section 4.4.1. also point to this possibility.

Lastly, domestic violence is arguably much broader than emotional, physical and sexual abuse. Indeed, sometimes the withholding of financial support from women by their partners is a form of economic abuse with potentially more dire consequences on children's wellbeing and survival. Yet it has not been possible to obtain data which adequately measures economic abuse.

In this regard, the availability of future survey data which allows for a broader measure of domestic violence as well as information regarding the timing of the violence reported, will be useful for further research on the links between child survival and a mother's experience of domestic violence for Sub-Saharan Africa. Even more enriching will be added insights into how men's reported experience of violence may also be related to child survival. Finally, the availability of a richer dataset which allows for further exploration of how these links might mediate infant mortality, and a mother's experience of domestic violence will help to shed more light on the actual mechanisms, if any, through which child survival is affected by their mother's experience of domestic violence.

5. Does Women's Asset Ownership Explain Children's Educational Achievement? Evidence from Ghana

5.1 Introduction

The importance of the effects of women's bargaining power on child welfare outcomes has been highlighted in the first two chapters of this thesis where the evidence was reviewed. Subsequently, in chapters three and four, the links between women's relative intra-household bargaining power and child health outcomes have been examined for children under the age of five. In line with the theme of examining the links between a woman's relative bargaining power and household investments in child welfare, this chapter seeks to advance the literature by investigating if the educational achievement of children is affected by their mother's ownership of assets using household data from Ghana.

A vast literature exists on the determinants of children's educational outcomes. Of what is known, maternal characteristics have consistently been shown to play a key role in children's educational outcomes. For example, studies have shown that a woman's level of education and exogenous changes in her income are positively associated with her children's schooling outcomes (Glick and Sahn, 2000, Doss, 2006). This literature, which is extensively reviewed in Glick and Sahn (2000), Fafchamps et al (2009) and Dito (2011), highlights two key research gaps. The first pertains to the choice of measures of child educational outcomes used in the analyses, while the second is related to their measures of the maternal factors.

In the first instance, for Sub-Saharan Africa, the predominant focus of existing studies was on schooling outcomes which do not include children's achievement or skill acquisition. Most empirical studies on the links between child educational outcomes and women's bargaining power have predominantly focused on the links between women's bargaining power and child school enrolment, grade attainment and household expenditure on child education. While these studies have been useful in shaping policy, recent empirical evidence shows that with the implementation of free compulsory basic education for all from the 1990s, and other measures aimed at encouraging school enrolment such as school feeding programmes targeted at children from poorer households, significant gains have been made in children's school enrolment. However, challenges remain with the inequalities in the quality of education children acquire even if they enrol.

Ghana, for example, has near universal enrolment rates in basic education. However, the wide degree of inequality in the skills acquired by children within the same cohort or age, remains a problem. According to UNESCO (2012), apart from children of primary school age who are out of school, there are about 25% of children in school worldwide who fail "to learn the basics" by the time they reach grade 4. While there may be several factors beyond the household which may impact on children's learning and consequently, their cognitive achievement, it is within the household that decisions are made regarding children's school choices. It is also within the household that time and resource investments are made to support a child to achieve. However not much attention has been given in the literature to the possible links between the intra-household power dynamics and child educational achievement.

While most studies on child educational outcomes have focused on other measures of child educational outcomes, few studies explain how child educational achievement is related to mother's bargaining power. In recent decades, during which most developing countries enacted policies aimed at ensuring that children have access to free compulsory basic education, the real opportunity cost of children's schooling to a household is not only measured by the expenditure or enrolment, which has been the focus of earlier studies (Glick and Sahn, 2000, Doss, 2006, Fafchamps, 2009, Dito, 2011). As pointed out by Akyeampong, (2009) there are often indirect costs associated with school attendance such as a child's time especially in poor households which may require child labour. Other possible challenges which may be veiled by the high enrolment rates are children's delayed enrolment or over age attendance which result in children not being at the right stage of schooling for their age and also contribute to poor achievement. Children's achievement therefore serves as a stronger measure of the opportunity cost to the household of educating a child since it captures both resource and time investments made in their education beyond what is made available by the government through the free compulsory basic education policy.

The second gap identified relates to measuring bargaining power, as alluded to in previous chapters of this thesis. In the intra-household literature on child education outcomes, data limitations have often made it difficult to obtain suitable measures of women's bargaining power leaving the analysis prone to measurement problems. This is addressed in this study by using more accurate measures of women's bargaining power, in particular share of ownership of assets within the household, and then subjecting the results to a battery of tests.

Since children's educational achievements are not only related to enrolment or grade attainment, but also to the time spent studying, and the quality of resources invested into their education at the household level, this study aims to add to the literature by exploring further the effects of a woman's bargaining power on children's educational achievement.

In this regard, this study seeks to examine how a woman's bargaining power affects child educational achievement in dual-headed households in Ghana. Specifically, it seeks to determine whether:

- i. a woman's bargaining power affects children's achievement in English and Mathematics,*
- ii. there are different effects of mothers' relative power on boys' and girls' achievement.*

The analysis focuses on children living with both parents³⁵ in the same household because it is only for such households that it is possible to construct measures of a woman's bargaining power, relative to her partner's. The sample of interest thus represents 54% of children aged between 9 and 15 years who were surveyed. In this study, a woman's relative bargaining power is measured in terms of her education relative to her partner's, her ownership of assets relative to her partner, and whether or not she suffers domestic violence. Children's educational achievement is measured using children's scores obtained from standardised English and mathematics tests.

³⁵ Care is taken to ensure that the children sampled live with their biological parents since the welfare of a child may be associated with whether their parents are biological or not.

To answer the above research questions, data is obtained from a nationally representative household survey collected by ISSER/Yale in 2009-2010, from which a sub-sample of children aged 9 to 15 living with both parents in the same household are selected. Due to the way the survey is designed, it is only for this age range that child test scores in English and mathematics are available along with the requisite information on ability required to serve as controls.

The main finding from the analysis is that a mother's ownership of assets does not seem to be important in explaining children's educational achievement in a consistent way. It appears that children's individual characteristics, school and location characteristics are most important in explaining boys' and girls' achievement in mathematics and English than their mother's relative ownership of economic assets in the households.

None-the-less, small depressing effects of a mother's non-farm enterprise assets share on boys' achievement in English and mathematics are found. One also finds that a woman's share of household durable goods is positively associated with boys' achievement in English and mathematics, but the impact is small. A boy with the mean English score will have about a 1.1 percentage point increase in his score for every 10-percentage point increase in his mother's share of household durable goods given that all other predictors are held constant. Similarly, a boy with the average maths score will experience a 0.8 percentage point increase for the every 10-percentage point increase in his mother's share of household durable goods given that all other predictors are held constant.

Only girls' achievement in mathematics is associated with her mother's relative ownership of agricultural land. The finding show that for a girl with the mean score in

mathematics , and holding all other predictors constant, a 10 percentage point increase in a woman's share of agricultural land is associated with an increase in girls mathematics test scores by at least, 1.3 percentage points.

The rest of the chapter is organised as follows: the literature is reviewed in section 4.2 following which sections 4.3 and 4.4 discuss the empirical framework and the data, respectively. Section 4.5 presents and discusses the empirical results, while section 4.6 concludes.

5.2 Related Literature

As mentioned in earlier parts of this thesis, there is increasing evidence that maternal bargaining power in the household is an important predictor of child welfare outcomes (Lundberg Pollak and Wales, 1997; Duflo, 2003; Doss, 2006; Fafchamps 2009). In particular, as alluded to in earlier chapters, studies by Glick and Sahn, 2000, Doss, 2006 and Dito, 2011 among others, also acknowledge the role of a mother's relative power, albeit measured in different ways, as a significant determinant of children's educational outcomes. In this section, the evidence is reviewed with a particular focus on studies from Sub-Saharan Africa. It begins with a review of the literature on the determinants of children's achievement before addressing the topic of interest, how children's educational outcomes are associated with a mother's bargaining power.

5.2.1 Determinants of educational achievement

The child education literature shows that children's educational achievement may be explained in part by children's own individual characteristics and demographic and

socio-economic factors which characterise their household, school, and community (Hanushek and Lavy, 1994; Oxaal, 1997; Schultz, 1999).

Individual child characteristics, that are known to influence their achievement, include age, gender and a child's own drive and innate learning abilities (Silverstien et al, 2001, Ginther, and Pollak, 2003). Children with higher abilities tend to attend school more regularly and stay in school longer enabling them to achieve better outcomes. On the other hand, children who do not have the ability to make sufficient progress or achievement in their learning, tend to be less interested in schooling, leading to poor attendance and consequent low achievement. For this reason, child ability is considered an important determinant of educational achievement. Past studies have also shown that children's test scores improve with age and grade attainment as well as the number of years spent in school all other things being equal (Glewwe and Jacoby, 1994).

A wide range of studies point to a significant gender gap in investments in child education in most developing countries (Colclough, et al, 2000; Dercon and Singh, 2011; Favara, 2016). Several explanations have been proffered regarding why girls generally tend to receive less investment in their education than boys. One reason is the perceived gendered roles of men and women in society. In communities where men are often seen to lead while women play subsidiary roles at the local and national levels, and socio-cultural norms and religious beliefs suggest that women's futures are tied to their roles as wives and mothers, there is less incentive for girls to be well educated as compared with boys. In addition, in societies in which the benefits to girls' education

goes to their husband's family, parents are more likely to favour boys' education than girls'.

A second reason lies with the perceived higher return to boys' education, as dictated by the jobs women do and the whether there is discrimination against women in the labour market. In addition, the gendered division of labour in households with girls perceived to have a comparative advantage in domestic work relative to boys makes girls better substitutes for the mother's labour if the mother is not able to do the domestic chores or care for other members of the family when the mother is not available. It is also known that sometimes the school environment and sanitary facilities may discourage girls from attending. All of these reasons may influence household decisions regarding investing in children's education,

Further, household characteristics including wealth, size, and composition are important determinants of child educational outcomes. (Glick and Sahn, 2000). Specifically, household wealth has been found to be positively associated with children's educational outcomes. This is because all other things being equal, a household's ownership of assets and its level of income influences its ability to invest in a child's education and what levels of investment are made. Poorer households in particular face higher opportunity costs of educating their children due to their resource constraints. Consequently, children from poorer households tend to have worse educational outcomes and face more time constraints due to labour demands on them in the household or to supplement the family income.

Household size and composition are also important in determining child-schooling outcomes. In larger households, where the number of children of school going age is

large, fewer resources are available for each child³⁶ and relatively fewer investments per child are expected to be made, all other things being equal. Second, when younger siblings are present in the household who require care, girls in particular are often required to provide support with childcare, meaning they have less time for leisure and study. On the other hand, if the composition of the household is such that there are more working adults and fewer children, there is the possibility of children being better off in terms of per capita investments in their education assuming all the adults make investments of time and other resources in their education.

Parental characteristics are also known to be important factors in the determination of children's educational outcomes. In particular, parental education has also been shown to be associated with child educational achievement. There is ample empirical evidence of a positive association between fathers and mothers' education and the educational outcomes of their children (see Fan and Chen, 2001; Davis-Kean 2005). This implies that children whose parents are educated tend to have better schooling outcomes than children whose parents have little or no education (Schultz, 1996, Glick and Sahn, 2000). Educated parents are more likely to invest more time and resources into their children's education, and are more likely to have higher expectations of their children as well as provide a stimulating learning environment for their children at home (Davis-Kean, 2005). Often related to the role of parental education is the role mothers' education plays in children's welfare in general, including their educational outcomes. However, a mother's education, relative to her partner is also sometimes used as a measure of bargaining power, (which will be considered in the next section). Finally,

³⁶ - based on the 'child parental resource dilution hypothesis'

school and community characteristics have also been known to influence children's education outcomes as shown for Ghana by Glewwe and Jacoby (1994).

5.2.2 Women's intra-household bargaining power and child educational outcomes

Several studies have shown that increased relative power of women is positively associated with child educational outcomes. For example, in terms of spending on child education, Thomas (1990) and Schultz (1990) show that non-wage income increases for mothers are more likely to be spent on children's health or education than increases in fathers' income. Similarly, Doss (2006) finds for Ghana that, increased bargaining power for women, measured in terms of asset ownership, is positively associated with the households' share of expenditure on children's education. Doss's study was however, limited to the analysis of the effects of women's relative bargaining power on the allocation of household expenditure to children's education but did not consider the educational outcomes.

It, however, appears from the literature that the response of child educational outcomes to parents' bargaining power may be gendered. Emerson and Souza (2007) investigate parent child relationships for Brazil and show that a similar gendered effect exists between parents and children, but not with all measures of bargaining power. Their study explores the intra-household gender links with child labour and school attendance in Brazil and finds that the level of the fathers' education, the age at which he begun working and his non-labour income significantly impact boys labour status than that of girls in the household, while the same is true for mothers with girls. They

also find that parental education and non-labour income have a greater positive impact on boys than on girls' schooling decisions, which suggests Brazilian parents invest more in boys rather than in girls' education when faced with making a choice between the sexes. Emerson and Souza (2007) are of the view that parents prefer to invest more in boys' education because of the higher opportunity cost of girls schooling, since girls contribute more to domestic household chores than boys do. Another reason may be the higher future returns to boys' schooling since their labour market participation is relatively higher than women who also earn relatively low wages and consequently less future incomes in view of their reproductive roles and household demands on their time. They explain that since girls eventually leave the household when they get married, in societies where parents rely on boys for care and support during their old age, investing more in boys' schooling would be a rational thing for parents to do.

This favouring of boys in household resource allocation is not only limited to investments in education but may also be observed in other household consumption goods. Fafchamps et al (2009) also find that when Ethiopian women have greater control over household purchases, the share of consumption on boys, but not girls', clothing increases implying that even women have gendered preferences when it comes to investments in child welfare.

However, the association between girls' educational outcomes and women's power is not necessarily always positive. This association is examined by Basu (2006) in relation to child labour and confirmed by Gitter and Barham (2008) using Nicaraguan data.

Basu (2006) hypothesises that when a woman's relative bargaining power exceeds a certain threshold in the household, girls are more likely to engage in child labour or

experience a drop in school attendance. Basu further explains that when mothers stand to benefit more from girls being out of school than fathers do, female children experience a reduction in school attendance if the mother has greater power relative to the man. Girls may instead have to devote more of their time to household production, easing the demands on the mother who would otherwise have to spend more time on domestic work. Also, the benefits of a boy's reduced attendance are likely to be less for the mother than the benefits from the girl's reduced school attendance and therefore the boys are not likely to be affected by increased power of the mother. Hence Basu (2006) suggests that in the case of girls, the relationship between child labour and women's relative power is U-shaped.

Using randomised experimental data from the Nicaraguan Social Safety Programme (*Red de Proteccion Social, RPS*), Gitter and Barham (2008) confirm Basu's hypothesis by investigating the effects of cash transfers to women on children's school enrolment and spending. In their study, women's power is proxied by her number of years of schooling relative to her husband's.³⁷ The study confirms findings of earlier studies that greater women's bargaining power is associated with increased spending of household resources on children. However, they also find that while there is a monotonic relationship between a woman's bargaining power (measured by her level of education

³⁷ According to Gitter and Barham (2008) the use of relative years of schooling is deemed a better measure of bargaining power since income or wage related measures are endogenous to household decision making and correlated with child wages which in turn can affect decisions on child enrolment. They explain that "*One advantage of the educational ranking approach is that education is exogenous to current income levels which are themselves endogenous to fundamental household decisions regarding labour allocation.*"

relative to the man's) and son's schooling, the relationship in the case of girls is non-linear as suggested by Basu 2006. This finding lends support to the fact that contrary to the assumption made by several researchers, the underlying relationship between a mother's bargaining power and child education outcomes may not necessarily be linear, depending on the sex of the child.

Chen (2011), uses Indonesian data which allows her to compare households with different levels of parental contribution to household income and decision-making. Chen's study concludes that, while the time spent on household production affects girls' schooling negatively and disproportionately, mothers' bargaining power (measured as her influence over household decision-making) *"is most effective in narrowing the gender gap"*.

Turning to the empirical evidence from Sub-Saharan Africa, Doss (2006) explored the effects of a woman's asset ownership on the share of household expenditure on children's education using data from Ghana and finds a positive association between the two. Similarly, using the same Ethiopian data, Fafchamps et al (2009) and Dito (2011) arrive at different conclusions on child schooling in Ethiopia. Fafchamps et al, (2009) find that various measures of women's bargaining power improved school attendance of children in rural Ethiopia. Their study showed that land and livestock brought to marriage by the woman, her having a source of non-farm income, and the magnitude of assets expected on divorce all had a positive effect on child schooling. However, Fafchamps et al, (2009) did not attempt to investigate the effects of the relative power balance of partners on boys and girls.

Dito (2011) investigates this effect using the same Ethiopian data and finds that the relationship between children's wellbeing and their mother's relative bargaining power varies with gender. While there is a U-shaped relationship between parents bargaining power and girls' labour, the relationship for boys is monotonic. Dito's study finds that relative to households with balanced power, there is an 8-percentage point decline in girls schooling when either parent has greater control over decisions on human capital investment in children. Dito (2011) also finds that, in households where the man alone decides on human capital investment, there is an even stronger negative effect on boys schooling – twice larger- than on girls' schooling.

Drawing from these two strands of literature, the empirical strategies for modelling children's educational achievement is discussed next followed by a presentation of the descriptive data.

5.3 Empirical Framework

The empirical framework adopted for modelling child educational achievement is based on the collective bargaining framework discussed in chapter two. We assume that parents' preferences are aligned to their children's and parents view their children's human capital development as an investment which is expected to yield returns over time. Thus parents allocate resources among different household demands, including their children's current welfare needs with the view to maximising household welfare in the long run. It is worth noting that, whereas educational outcomes are determined by both demand and supply side factors, this study focuses on modelling the demand side due to its focus on the household.

The intra-household bargaining model assumes that parents internalise the preferences of their children, however mothers and fathers also have different preferences in their decisions regarding the allocation of resources as shown by Lundberg, Polack and Wales, (1997) for example. This implies that holding all other determinants constant, children's educational outcomes, resulting from parental negotiations, are also a reflection of parental preferences and relative bargaining strengths.

The evidence suggests that between parents, women tend to favour higher allocations of household resources towards children than men do. This view is supported by the evidence from studies by Lundberg, Polack and Wales (1997); Duflo (2003) and Doss (2006) which show that child welfare outcomes or their shares of the household budget are enhanced when women's bargaining power is increased. Thus, in modelling children's educational outcomes, this study incorporates a relative bargaining power measure to capture the woman's bargaining power relative to the man's for each parental couple in a standard model of child educational outcomes.

Achievement is therefore modelled as a function of child, household, parent and community characteristics in addition to parents' relative bargaining power (BP) as shown in equation (5.1).

$$Y_i = \sum_{j=1}^J \beta_j HC_j + \sum_{k=1}^K \beta_k PC_k + \sum_{l=1}^L \beta_l CC_l + \sum_{m=1}^M \beta_m SC_m + \sum_{n=1}^n \beta_n BP_n + \varepsilon_i \quad (5.1)$$

where Y_i is the education achievement of child i , measured as scores obtained in Mathematics and English tests. HC_j is a vector of household characteristics, PC_k is a

vector of parental characteristics, CC_i is a vector of child characteristics, SC_m represents a vector of school characteristics and location-specific control variables. Finally, BP_n represents a measure of a woman's bargaining power relative to her partner. Details on the variables and their associations with child educational achievement are further discussed when the results are presented in section 5.5.

5.3.1 Empirical strategy

The analysis of the effects of a woman's ownership of assets on the educational achievements of her children is carried out using a variety of estimation methods based on the model presented in equation (5.1). The data analysis is carried out using appropriate techniques for regressions involving count data. This is however preceded by OLS and Heckman two-stage least squares regression analysis which provide crude estimates of the associations between test scores and their determinants. These regressions are also employed as a mechanism for evaluating the robustness of the results. The section begins first with the discussion of the results from the model of children's achievement in mathematics followed by their achievement in English. Both sub-sections begin with a discussion on the determinants of achievement before focusing on the results for the effects of women's asset ownership on children's achievement.

To begin with, the data is analysed using OLS regression techniques to determine the nature of the associations between test scores and the determinants of achievement. However, given that some children fail to take the test, potential biases may arise from sample selectivity. Therefore, a Kolmogorov-Smirnoff test is carried out to determine whether the samples for those children who took the test and those who did not are

statistically different. The results, indicate that there is a significant statistical difference between the two samples. Consequently, a Heckman two-stage model is used instead to address the sample selectivity and correct for the bias in the OLS estimates.

Further, given that the dependent variables (test scores) are discrete and not normally distributed, they are not well estimated by the OLS but better estimated using methods for estimating count models. I find that neither the Poisson nor Binomial provides a suitable fit for the data. This is because an examination of the test score data reveals an excessive number of zeros and further shows a larger variance than the mean. In view of the over-dispersion of the data and following Long and Freese (2006), I find that the zero-inflated negative binomial regressions provides the best fit of the data over the zero inflated Poisson regression method. This is because unlike the zero-inflated Poisson estimation, the ZINB method, takes into consideration the fact that the zero scores may have resulted from two processes. One, the fact that the child took the test but scored zero (which is an authentic zero score) and second the fact that a child may not have taken the test at all for other reasons and is therefore assigned a zero score (a certain zero) even though they could have had a different score. Using the three estimation approaches also serves as a robustness check for the estimated results.

5.4 Data and Descriptive Statistics

This study uses nationally representative cross-sectional data collected between November 2009 and April 2010 in a household survey covering 5009 households and 18,889 individuals, in Ghana. The data was collected by the Institute of Statistical, Social and Economic Research, (ISSER) of the University of Ghana and the Yale University's

Economic Growth Centre (EGC) as a baseline of what is intended to be a panel spanning 15 years. It includes rich household, individual, school and community information relevant for modelling child educational outcomes in addition to a range of parental characteristics useful for computing measures of parents' relative bargaining power.

First, for each biological child living with both parents in the same household, information is available for the computation of a vector of variables, which serve as measures of their mother's bargaining power relative to their father's based on their individual asset ownership. From this data, bargaining variables related to asset ownership (land, livestock, Agricultural tools, household durable assets, non-farm enterprise assets, and financial assets), education, formal employment, contribution to marriage, and whether or not a woman has been the victim of domestic violence, can be computed.

The data also includes test scores in English and Mathematics (for children aged between 9 and 24 years), and scores on Raven's Pattern test and a digit-span test (for children aged 5 to 15 in addition to school enrolment and school characteristics if the child is enrolled. The availability of scores of the Raven's Pattern test and the digit span tests, for children aged nine to fifteen presents an uncommon opportunity to model children's educational achievement in Mathematics and English while controlling for their innate abilities or natural endowments using nationally representative data from Sub-Saharan Africa.

5.4.1 Sample characteristics

Given the need to measure women's relative bargaining power, the sample selected for this analysis is limited to households in which both parents are present as it is only in

these households that a measure of the mother's bargaining power relative to the father's can be obtained. Our sample of interest is therefore made up of 1,523 children aged between the ages of nine and fifteen years who live with both parents. It is a sample of children living with both parents selected from the 3,385 children aged between nine and fifteen from 2,207 households who were surveyed. Of these, 1,840 (54%) children lived with both parents however, 113 of these households are polygamous, and therefore only the children of the senior wife are included in the sample. This leaves 1,523 children from 960 households who lived with both biological parents, one of whom was the household head and for whom data on both child and parent's characteristics were available. There are relatively more boys (55%) than girls (45%) in the sample. The large disparity between the proportion of girls and boys appears unusual, but it is a reflection of the larger sample of children of this age range who were surveyed. The survey data shows that many more girls than boys of this age range are likely to live away from their parents. Whereas it is not possible to tell why they were away, anecdotal evidence suggests that Ghanaian children may leave home to live with another relative in order to provide services to the family in exchange for the opportunity to go to school or learn a trade. Child fostering of this nature is not an unusual practice in Ghana.

Regarding location, 30 percent of the sampled children live in urban areas, while 70 percent live in rural areas. Further, a third (33 percent) of the children live in the three northern regions of the country.

The average household size is about seven, but rural and northern households are slightly larger (see Table A5.1 in appendix 5). Table 5.1 shows that almost all the

households sampled are headed by men, only in one percent of the responses was the woman indicated as the head of household. The percentage of female-headed urban households is more than the average. Northern households however hardly have any female heads. This is again not surprising because northern ethnic groups are very patriarchal, while the Akans who dominate the Ashanti, Bono Ahafo, Eastern, and some parts of the western and central regions of Ghana are matrilineal. Besides, it is culturally the norm for the man to be named as the 'head' of a dual headed household, even if it is only nominal and not because he is responsible for its upkeep.

In relation to parents, fathers of the children sampled have completed more years of schooling, on average, than mothers (see Table 5.1) and as expected urban parents have spent more time in school than rural parents (see Table A5.1, in appendix 5). However, the differences between the schooling of urban and rural mothers and northern and other women are very pronounced. Rural women have spent only about half the time urban mothers have been to school, mothers of children from the north have on average only about a third of the levels of schooling that mother in the rest of the country have acquired. This is expected to have implications for the educational outcomes of their children, especially their girl children.

On average, 63 percent of the children sampled come from Christian households, 24 percent are Muslim and seven percent practice traditional religion. The remaining seven percent belong to other religions. As is to be expected however, the north has a smaller proportion of Christian children (32 percent) but a relatively larger percentage who practice Islam (48 percent) and traditional religion (18 percent). These religious statistics are in agreement with census data on Ghana. About 42 percent of children

Table 5. 1: Means and Standard Deviations of Parental and Household Characteristics

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Household size</i>	6.87	2.46
<i>Female household head=1 (%)</i>	01	11
<i>Children aged 7-18</i>	2.58	1.23
<i>Age of mother</i>	40.71	8.43
<i>Age of father</i>	48.77	10.64
<i>Mother's years of schooling</i>	3.46	2.94
<i>Father's years of schooling</i>	4.75	3.28
<i>Years of schooling household head</i>	4.75	3.28
<i>Sum of parents' years of schooling</i>	8.21	5.59
<i>Household assets (000 GHC)</i>	4.42	10.61
<i>Household consumption (000 GHC)</i>	3.28	3.08
<i>Ag land ownership =1 (%)</i>	42	49
<i>Non-farm Ent ownership =1 (%)</i>	41	49
<i>Religion (shares in percentages):</i>		
<i>Christian</i>	63	48
<i>Muslim</i>	24	43
<i>Traditional religion</i>	07	25
<i>Other religion</i>	07	25

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data

surveyed come from households that own agricultural land, but land ownership is more common in rural (53 percent) and northern (59 percent) households and least common

in urban areas (14 percent). This is not surprising since, it may be a reflection of the high dependence in the rural areas on agriculture for their livelihoods.

With regards to non-farm enterprises (NFent), about 41 percent of households reported that they owned non-farm enterprise assets. But unlike Agricultural land ownership; non-farm enterprise ownership is predominant among urban households and the non-northern regions. This may be capturing the prevalence of retail trade in the Ghanaian informal sector. Such enterprises tend to thrive more in the populated and relatively economically vibrant urban and southern areas.

The next section provides a more detailed descriptive analysis of the variables of interest in this study.

5.4.2 Descriptive statistics

Educational outcomes and child characteristics

The term 'achievement', refers to the degree of competence or mastery attained by a person in a given area of study. In the education literature, (example Davis-Kean, 2005; Magnuson, 2007), outcomes of tests are widely used to measure educational achievement. This study focuses on achievement in mathematics and English. Basic English and mathematics tests were administered to all children of the household aged between nine and 24. Each child took the same test comprising eight standard questions irrespective of their age. Based on their responses, a measure of achievement is computed as the proportion of correctly answered questions by a child in each test.

The English test involved reading a short passage and answering questions based on it. For each question, four possible responses were provided out of which respondents

were asked to select one. The maximum score obtained in the English test was 8 out of eight. The lowest was zero. Similarly, the mathematics test was made of 8 questions testing the abilities of respondents to perform the four basic mathematical operations (adding, subtracting, multiplying and dividing) on not more than two-digit numbers. The descriptive statistics of child characteristics and educational outcomes are presented in Tables 5.2 and A5.1 of appendix 5.

The descriptive statistics show an overall high level of enrolment (96 percent on average) and a negligible gender gap between boys and girls during the period of the survey. This corroborates more recent statistics on enrolment in Ghana, which suggest that the Gross Enrolment Ratio (GER) is about 97 percent (MOE, 2012). There is however a marked rural

Table 5. 2: Child Characteristics and Educational Outcomes by Gender

<i>Variable</i>	<i>BOYS</i>			<i>GIRLS</i>		
	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>
Age (years)	842	11.88	2.00	681	11.80	1.95
Enrolled =1	842	0.96	0.20	681	0.95	0.21
Years of schooling	842	3.69	2.07	681	3.79	2.29
SAGE	842	0.63	0.30	681	0.64	0.31
SAGE=0 (%)	842	5	22	681	6	23
SAGE>=1 (%)	842	16	37	681	18	38
Math score (%)	701	59.99	25.18	569	58.37	26.28
English score (%)	575	52.43	33.02	466	55.15	34.86
Raven score (%)	782	47.26	21.89	637	46.01	22.54
Digit span test score (%)	767	41.74	18.68	617	42.02	20.64

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data

urban difference (not presented here) with rural girls having the lowest enrolment rates in the sample under consideration.

Age-related grade attainment or schooling-for-age (SAGE) is defined as the total number of years of schooling completed by a child, expressed as a share of the number of years they should have spent in school, given that they are required to start compulsory schooling at a particular age. (see Psacharopoulos and Yang, 1991). SAGE is calculated as in equation 5.2:

$$SAGE_i = \frac{Y_{Si}}{Y_{Ai} - Y_{Ci}} \quad (5.2)$$

Thus the SAGE of child i is calculated as the total number of complete years child i spent in school (Y_{Si}) divided by the difference between child i 's current age, (Y_{Ai}) and the age at which child i should have started school (Y_{Ci}) which is six years for Ghana.

A SAGE value of zero implies that a child of school-going age has not spent up to a year in school, whereas values of SAGE between zero and one indicate a lower period spent in school than expected for their age. A SAGE value of one indicates that the child has spent the required number of years in school for their age, and values greater than one are attained by children who have more years of schooling than expected for their age.

Table 5.3 shows that, on average the children sampled completed a lower than expected number of years in school for their age. (0.63 for boys and 0.64 for girls). The data further shows that five percent of boys and six percent of girls have not completed up to one year of schooling, whilst only 16 percent of the boys and 18 percent of girls are on target or been in school longer than required for their age. This implies that

Ghanaian children are generally starting school later than 6 years, which may explain why the gross enrolment rates (which do not take into account the ages of the children of a particular cohort) in Ghanaian schools are generally higher than net enrolment rates (which also relate enrolment to children being in an age-appropriate cohort). According to the Ministry of Education, the Net Enrolment Ratio (NER) in 2012 was 82 percent, while the Gross Enrolment Ratio (GER) was 97 percent. (MoE, 2012).

The rural-urban gap in SAGE is at least 18 percentage points (see Table A5.1 in appendix 5) which means that there is either a delayed start in schooling for children who live in rural communities, or they drop out of school early. If the former is true, it could still have negative ramifications on progression and children's educational achievement. There is almost a year's difference in schooling between rural and urban children. This can potentially drive up achievement scores in urban areas, holding all else constant.

The Raven's pattern cognitive test (RPCT) is a nonverbal cognitive test originally developed by John C. Raven in 1936. The test, which is typically administered to children, aged five and above, is a standard, simple and practical test commonly used in educational settings. Its appeal lies in the fact that, it does not require any language, reading or writing skills and thus can be said to be purely a test of a child's cognitive ability. Twelve multiple-choice questions were administered in the survey to children aged 5 to 15 years. Each question was made up of a matrix of patterns with one pattern missing and children were required to identify the missing element required to complete the matrix. For each pattern rightly identified, the child scores one point, thus children score a maximum of 12 points on the test.

Similarly, a child's score on the Digit-span test (DST) measures their capacity to store numbers in their working memory. In the survey, children aged 5 to 15 years were presented with a series of digits (e.g., "2-5-9") and asked to repeat them immediately. Children who were successful were successively given longer lists after each success, each with one additional digit. The testing was carried out to test their abilities to recall digits forwards and backwards. Conventionally, a person's digit-span is the length of the longest list they are able to remember and on average, individuals do better at forward recall than they do at backward recall. However, for the purposes of this study, I assign a score of 1 point for every stage successfully completed and sum up the scores for the forward and backward digit-span test. Given the design of the test, children can score a maximum of 8 points each on the forward and backward recall tests, making 16 points in total on the digit-span test. The highest score in the sample of 9 to 15 year olds was 15 points or about 94 percent.

Not surprisingly, the scores on the Raven's pattern cognitive test and the digit-span test are highly correlated. While there are no significant differences in the scores for boys and girls (as expected from the literature on cognitive ability), there is a difference of about 10 percentage points in the RPCT score between urban and rural children and 13 percentage points in their DST scores implying that there is some correlation between the children's location and their cognitive ability.

The test score results show an overall better performance in Mathematics than in English for all children. However, on average, girls had better scores in English (55 percent) than boys (52 percent). Boys on the other hand, scored about 2 percentage points more than girls in mathematics on average. The scores for boys and girls in

mathematics were 60 percent and 58 percent respectively on average. Significant rural-urban differences exist in test scores. The difference between urban and rural Mathematics mean scores is 13.5 percentage points for boys and 16.8 percentage points for girls. In English, the difference is even larger, 22.8 percentage points for boys and 24 percentage points for girls. This highlights the pronounced rural-urban inequality in educational achievement, which has been raised in the literature on education in Ghana.

Bargaining variables

The data set contains information on individual physical and financial asset ownership as well as a woman and her partner's education, her employment status and her relative income. Specifically, information is provided about the values of a woman and her partner's individual ownership of household durable assets, savings, land and non-farm enterprise assets. From this information, measures of relative bargaining power are constructed using the values of a woman's ownership of physical, financial and assets relative to her partner and whether or not she is employed outside the home. It is important to note that not all households reported owning assets and therefore bargaining variables are constructed only if a household owns the asset in question. For example, since only 42 percent of households report owning agricultural land, the relative share of a woman's ownership of agricultural land is constructed for only those households.

Information is available on the mother and father's years of schooling for only 1,486 of the children sampled. Therefore, for each of these children, I construct a measure of their mother's education relative to her partner. To do this I use information provided

on grade attainment and literacy levels, which are re-coded into years of education in order to find the woman's share of parental education. The data shows that mothers of children in our sub-sample have on average about 1.3 years of schooling less than their partners. The bargaining variable of interest is mother's relative schooling, which is defined as the ratio between the number of years a mother of a particular child has spent in school and the sum of both parent's years in school. On average, mothers had about 42 percent of total parental education, with no significant differences between mothers from rural and urban households nor between northern and other households.

Parents of 858 children reported that they had savings. I construct the mother's savings share as the mother's share of total parental savings expressed as a percentage. This measure includes both formal and informal savings of the woman and her partner. From the entire sub-sample of households, I find that on average, women's savings is about twelve percent of combined parental savings with a 9 percentage point difference between urban (19 percent) and rural women (10 percent). Women's average savings share for only households who do save is however higher. On average in households with savings, the mother's share of parent's total saving is about 22 percent. Urban women have the most savings share (27 percent) whilst rural women only have about 19 percent. This implies that if a woman's share of savings is an indication of her bargaining power in household decisions, then urban women have a greater influence in bargaining than rural women do.

The mother's share of household durable assets is the value of household durable assets belonging to the mother expressed as a percentage of the total value of parent's

Table 5. 3: Means and standard deviations of Bargaining Variables

<i>Variable</i>	<i>N³⁸</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Mothers share of total parents' schooling (%)</i>	1486	42.38	16.50
<i>Mother's share of parents' savings (%)</i>	858	21.95	33.62
<i>Mother's share of household durable assets (%)</i>	1523	22.33	23.39
<i>Mother's share of non-farm ent. Assets (%)</i>	337	61.31	43.96
<i>Mother's share of Ag. Land (%)</i>	508	5.48	20.41
<i>Mother's income (GHC)</i>	1523	7.90	57.82
<i>Mother is formally employed=1 (%)</i>	1523	0.04	0.19

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data

household durable assets. While the data provides information on ownership of each household asset, the household durable asset measure is the value of durable assets including house ownership and ownership of furniture, phone, radio and television, refrigerators, cooking stoves, and vehicles. For each of these, information on the two most important owners is provided along with the values of those assets, which are used to assign ownership shares of household durables. The resulting measure shows that women own a significantly smaller share of household durable assets, which is 22 percent on average. Again, there is about a one percentage point difference between the urban and rural women's share of household durable assets. Northern women also

³⁸ Note that N is based on the whether a household owns the asset in question or not. For households that do not report ownership of a particular asset, a woman's asset share is not computed.

have a lower share of household durables (18 percent) compared with the rest of the country (24 percent).

Similarly, a woman's ownership of agricultural land and non-farm enterprise assets were computed by finding the value of a woman's share of agricultural land or non-farm enterprise assets and expressing them as a share of the respective values of land and non-farm enterprise assets owned by both partners. On average, women's share of ownership of agricultural land is only about 5 percent. This reflects the rarity of women's ownership of agricultural land in Ghana as also seen in Oduro et al 2010. In households which own non-farm enterprise assets, women's share of non-farm enterprise assets is on average about 61 percent, also reflecting the dominance of women in small scale retail enterprises.

Mother's employment and income are defined as a mother being employed outside the home and the income she earns from that employment respectively. The data provides information on formal employment and based on this, it is observed that very few mothers, only about four percent of mothers in the sub-sample of mothers who work, worked outside the home. A larger proportion of women in urban areas (9 percent) than in rural areas (2 percent) or women from the north (2 percent) worked outside the home. As expected, women who work outside the home in urban areas have higher levels of income (214.3 Ghana cedis) than their rural counterparts (151.6 Ghana cedis). We next explore the possible associations between women's bargaining power and child educational outcomes in tables 5.4 and 5.5.

Table 5. 4: Correlation of women's bargaining power³⁹ and children's achievement

<i>Bargaining power</i>	<i>All</i>	<u><i>English</i></u>		<i>All</i>	<u><i>Mathematics</i></u>	
		<i>Boys</i>	<i>Girls</i>		<i>Boys</i>	<i>Girls</i>
<i>Mothers years of schooling</i>	0.3328* 0	0.3254* 0	0.3363* 0	0.1993* 0	0.1674* 0.0001	0.2375* 0
<i>Mothers ownership of hh durable assets</i>	0.1329* 0	0.1311* 0.0021	0.1377* 0.0039	0.1003* 0.0016	0.0949* 0.0263	0.1127* 0.0183
<i>Mothers ownership of Ag land</i>	-0.0043 0.8924	0.036 0.4001	-0.0474 0.3221	0.0304 0.341	0.0572 0.1814	0.0006 0.9905
<i>Mothers ownership of NFENT</i>	0.0527 0.0983	0.0306 0.4744	0.0666 0.1642	0.0749* 0.0187	0.0998* 0.0194	0.0739 0.1223
<i>Mothers savings</i>	0.0754* 0.0179	0.0397 0.3541	0.1094* 0.022	0.0416 0.1921	0.0088 0.8369	0.0774 0.1058
<i>Woman works</i>	0.1209* 0.0001	0.0970* 0.0232	0.1389* 0.0036	0.0924* 0.0037	0.0708 0.0979	0.1150* 0.016
<i>Woman's income</i>	0.1102* 0.0005	0.0971* 0.023	0.1197* 0.0121	0.0875* 0.006	0.0741 0.0832	0.1052* 0.0278

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data *coefficients and significance level reported*

* implies 5% significance level or less

³⁹Note that these are not relative to her spouse

Table 5. 5: Correlation between women's relative bargaining power and children's achievement

<i>Relative Bargaining Power</i>	<i>English</i>			<i>Mathematics</i>		
	<i>All</i>	<i>Boys</i>	<i>Girls</i>	<i>All</i>	<i>Boys</i>	<i>Girls</i>
<i>Mothers share of parental years of schooling</i>	0.0184	0.0078	0.0298	0.003	-0.0117	0.0223
	0.564	0.8554	0.5342	0.9247	0.7846	0.6422
<i>Mothers share of parental hh durable assets</i>	0.1398*	0.1426*	0.1321*	0.1395*	0.1380*	0.1429*
	0	0.0008	0.0056	0	0.0012	0.0027
<i>Mothers share of parental Ag land</i>	0.0133	0.0699	-0.0536	0.1079	0.1385	0.0697
	0.8196	0.3652	0.5494	0.0632	0.0717	0.4361
<i>Mothers share of parental NFENT</i>	-0.0241	-0.0737	0.0348	-0.0255	-0.0284	-0.0221
	0.4493	0.0846	0.4676	0.4247	0.5069	0.6453
<i>Mothers share of parental savings</i>	0.0595	0.0318	0.0837	0.0133	-0.0015	0.0312
	0.0617	0.4582	0.0801	0.6764	0.9718	0.5154

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data *coefficients and significance level reported*

* implies 5% significance level or less

A look at the data shows associations between educational achievement and aspects of a woman's bargaining power, measured in absolute values. Table 5.4 shows that women's education, their ownership of household durable goods and to some extent their employment and income are positively associated with children's mathematics and, English scores. Also, her ownership of non-farm enterprise assets is positively associated with girls' mathematics scores while boys English scores are positively associated with her savings. Surprisingly, her ownership of agricultural land does not seem to have any statistically significant associations with children's educational achievement. However, when her relative share of assets is considered as in table 5.5, only her share of household durable goods is shown to be associated with children's achievement in English and mathematics. I however proceed next to the regression analysis to investigate further.

5.5 Regression Results

A gendered analysis is carried out, taking into cognisance, the evidence from previous studies of gender differences in household investments in child schooling. Separate regressions are presented for boys and girls in addition to the pooled regressions in order to identify what gender differences may pertain to the determinants of boys' and girls' achievement in Mathematics and English. Although test scores are discrete, OLS and Heckman coefficients are estimated as robustness checks. The variables of key interest are those from the negative inflated negative binomial regression which take into cognisance the fact that the test data is discrete. Baseline models of the determinants of mathematics and English scores are presented in appendix 5 In

reporting the results, the two-step Heckman regression results are presented under the models titled (1) and (2) respectively, for the gender-disaggregated samples. The zero inflated negative binomial regression results are also presented in two parts- the coefficients in the section sub-titled 'inflate' are the results from the logistic model predicting whether a child has a certain zero test score. The results from the regressions of Mathematics test scores are discussed next followed by those from the regressions of the English test scores.

5.5.1 Effects of mother's bargaining power on children's achievement in mathematics

As previously indicated, this sub-section begins with a discussion of the determinants of mathematics scores, before it addresses the effects of a woman's asset ownership on mathematics test scores. The Heckman and zero-inflated negative Binomial (ZINB) regression results for the baseline models of the determinants of children's achievement in mathematics are presented in Tables A5.2 and A5.3. For each table, the results for the pooled sample are presented in the first column headed 'All', followed by the gendered-disaggregated results for boys and girls in the second and third columns respectively. OLS regressions (see A5.4) were run to serve as a robustness check.

The results show that the key determinants of children's achievement in mathematics remain the child's individual characteristics, the school characteristics and their location. Although parental and household characteristics are important, we find in the case of Ghana that they are not necessarily important in explaining the differences in children's scores in mathematics. I go on next to investigate whether women's intra-household bargaining power which is measured by a number of measures of a woman's

ownership of assets relative to her husband, will be important in explaining achievement in mathematics

A summary of the results of the regressions of girls' and boys' mathematics achievement are presented in Table 5.4. separate regressions are run based on equation (5.1) but this time for each regression, variables are included which measure a woman's bargaining power and where needed controls are included to account for the household's endowment with the asset in question. Since not all household may report owning a given category of assets, the woman's share of assets is interacted with a dummy variable which takes on the value 1, if the household reports owning the assets in question and zero otherwise. In Table 5.4 I only present a summary of the results obtained from the OLS, Heckman and ZINB regressions for the coefficients of bargaining power. In all, I explore four measures of asset ownership- relative ownership of agricultural land, ownership of household durable goods relative to partner, ownership of non-farm enterprise assets relative to her partner, and her ownership of savings relative to her partner. I also explore the effects of a woman's share of parental education and whether the woman works outside the home on children's maths scores.

Based on the regressions results, a mother's bargaining power as measured in this study was not consistently shown to be statistically significantly associated with her children's scores in mathematics. For example, the ZINB regression results do not show any marked effects of women's bargaining power on children's achievement in mathematics. Most of the coefficients are not statistically significant, and where they are the coefficients are close to zero which implies the exponent of the coefficient is close to one meaning the effect is negligible.

For example, in the case of boys, as shown in Table 5.6, the zero-inflated negative binomial regression shows that a woman's share of non-farm enterprise assets, has a very small depressing effect on her son's achievement in mathematics while her ownership of household durable assets increases boys with average maths scores achievement by a factor nearly close to one. In both cases the change is negligible since the coefficients are nearly zero and translate to a change factor of one.

Whereas the OLS results show a strong significant relationship between boys' Mathematics scores and their mothers' share of household durable assets, the magnitude is rather small. On average boys test scores increase by 0.08 percentage points for a one percentage point increase in the mother's share of household durable assets, holding all other things equal. This would imply that when a mother's share of household durable assets increase by 10 percentage points, her child's score in mathematics will increase by 8 percentage points. Even though the coefficient of household durable assets share is shown to be significantly different from zero at the 10 percent level of significance in the ZINB regression, the

Table 5. 6: The effects of women's bargaining power on children's achievement in mathematics

	<u>OLS</u>			<u>Heckman</u>			<u>ZINB</u>			
VARIABLES	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	
Mothers share of schooling	0.09	0.1	0.11	0.07	0.10	0.14	0	0	0	
	-0.074	-0.094	-0.123	(0.139)	(0.187)	(0.129)	-0.001	-0.002	-0.002	
Total parental hh durable assets	-0.13	-0.24	-0.18	-0.18	-0.36	-0.12	0	0	-0.01	
	-0.295	-0.452	-0.387	(0.563)	(0.857)	(0.414)	-0.005	-0.008	-0.007	
Mothers share of parental hh durable assets	0.03	0.08*	-0.03	0.01	0.04	-0.02	0	0.00*	0	
	-0.031	-0.044	-0.045	(0.061)	(0.087)	(0.049)	-0.001	-0.001	-0.001	
HH owns Ag land # Total value of parental Ag land	0.07	0.1	0.03	0.02	-0.01	0.01	0	0	0	
	-0.072	-0.116	-0.091	(0.131)	(0.215)	(0.100)	-0.001	-0.002	-0.002	
HH owns Ag land # Mother's share of parental Ag land	0.10**	0.1	0.13*	0.10	0.08	0.15*	0	0	0	
	-0.052	-0.072	-0.074	(0.094)	(0.134)	(0.079)	-0.001	-0.001	-0.001	
HH owns NFENT # Total value of parental NFENT	0	0	0	0.00	0.00	-0.00	0	0	0	
	0	-0.001	-0.001	(0.001)	(0.001)	(0.001)	0	0	0	
HH owns NFENT # Mother's share of parental NFENT	-0.02	-0.03	-0.01	-0.03	-0.03	-0.01	-0.00**	-0.00*	0	
	-0.018	-0.025	-0.027	(0.036)	(0.050)	(0.030)	0	0	0	
HH has savings # Total value of parental savings	0	0	0	0.00	-0.00	0.00	0	0	0	
	-0.002	-0.002	-0.002	(0.003)	(0.004)	(0.002)	0	0	0	
HH has savings # Mother's share of parental savings	-0.03	-0.02	-0.02	-0.03	-0.01	-0.05	0	0	0	
	-0.022	-0.032	-0.031	(0.043)	(0.058)	(0.035)	0	-0.001	-0.001	
Woman Works	0.98	1.29	-1.6	1.08	2.45	-4.37	0.03	0.01	0.03	
	-4.179	-5.725	-6.763	(8.194)	(10.355)	(7.801)	-0.074	-0.097	-0.124	
Observations	1,214	674	540	1,369	759	610	1,369	759	610	
***	p<0.01,	**	p<0.05,	*	p<0.1,	coefficients	and	Standard	Errors	reported

Magnitude of the coefficient is almost zero, indicating a very small change in boys' Mathematics scores resulting from a change in a woman's share of household durable assets.

Next, the Heckman regressions suggest that a woman's ownership of agricultural land relative to her husband, is important (significant at the 10% level) in explaining her daughter's test scores. Specifically, for a girl with the average score in mathematics, an increase in her mother's share of parental agricultural land by one percentage point is associated with a 0.15 percentage point increase in her test scores if all other predictors are held constant. This translates into a 1.5 percentage point increase in girls' mathematics scores for a 10 percentage point increases in a woman's share of agricultural land. This importance of a mother's relative ownership of agricultural land in explaining her daughters mathematics results is also corroborated by the OLS but not the ZINB results.

While the results seem surprising, it is possible that as observed before, other factors, as mentioned earlier, are more important in explaining children's achievement in mathematics than their mother's bargaining power.

5.5.2 Effects of mother's bargaining power on children's achievement in English

The results of the regressions for children's achievement in English are presented in tables A5.5-A5.7 of appendix 5. The results show that the important determinants of a Ghanaian child's achievement in English is are their own natural cognitive abilities, their age and time spent in school relative to their age, as well as their location, and whether or not they attend a private school. While gendered differences emerge in the results,

they are not markedly distinct. I turn next to consider the effects of women's bargaining power on English achievement.

A summary of the results for the effects of women's bargaining power are presented in Table 5.7. Given that the basic determinants of children's achievement in English have been discussed in the previous section, I focus this section on the discussion of the coefficients of bargaining power obtained from the individual regressions.

The results suggest that a woman's share of household durable assets seems to be important in explaining children's achievement in English however the effects seem to be different for boys and girls. The Heckman regressions suggest that all other predictors being held constant, a decrease in English scores of 10 percentage points results from a one-percentage point increase in a woman's share of household durable assets for a girl child with a mean English score. The coefficients for the OLS regression corroborates the estimates from the Heckman regression however, the estimated coefficient for the ZINB regression is zero. The opposite effects are found for boys – the estimated OLS (0.11) coefficient suggests a significant and positive association between a mother's ownership of household durable assets and boys English test scores although the magnitudes of the ZINB (0.00) are minimal.

The ZINB results also seem to suggest that the English scores of boys from household's that own non-farm enterprise assets are negatively associated with women's share of non-farm enterprise asset ownership. Even though the zero coefficients from the ZINB result suggest

Table 5. 7: The effects of women's bargaining power on children's achievement in English

VARIABLES	OLS			Heckman			ZINB			
	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	
Mothers share of schooling	0.13	0.2	0.02	0.13	0.22	0.03	0	0	0	
	-0.102	-0.132	-0.174	-0.123	-0.171	-0.165	-0.002	-0.002	-0.003	
Total parental hh durable assets	0.14	0.26	-0.15	0.11	0.23	-0.16	-0.01	-0.01	-0.01	
	-0.384	-0.574	-0.527	-0.491	-0.77	-0.516	-0.006	-0.009	-0.009	
Mothers share of parental hh durable assets	0	0.11*	-0.11*	0.01	0.11	-0.10*	0.00*	0.00*	0	
	-0.043	-0.061	-0.061	-0.053	-0.078	-0.061	-0.001	-0.001	-0.001	
HH owns Ag land # Total value of parental Ag land	0.02	-0.05	0.06	0.01	-0.08	0.06	0	0	0	
	-0.1	-0.15	-0.137	-0.118	-0.197	-0.128	-0.002	-0.003	-0.002	
HH owns Ag land # Mother's share of parental Ag land	0.02	0.07	-0.01	0	0.06	-0.02	0	0	0	
	-0.069	-0.094	-0.103	-0.085	-0.123	-0.1	-0.001	-0.002	-0.002	
HH owns NFENT # Total value of parental NFENT	0	0	0	0	0	0	0	0	0	
	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0	0	0	
HH owns NFENT # Mother's share of parental NFENT	-0.02	-0.06	0.02	-0.03	-0.06	0.02	0	-0.00**	0	
	-0.026	-0.034	-0.039	-0.031	-0.044	-0.038	0	-0.001	-0.001	
HH has savings # Total value of parental savings	0	-0.01***	0	0	-0.01**	0	0	-0.00***	0	
	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003	0	0	0	
HH has savings # Mother's share of parental savings	0.02	0.03	0	0.02	0.03	0	0	0	0	
	-0.03	-0.043	-0.044	-0.037	-0.049	-0.043	-0.001	-0.001	-0.001	
Woman Works	1.33	9.39	-5.77	1.33	8.18	-4.96	0.01	0	0.03	
	-5.488	-7.402	-9.554	-7.202	-9.308	-9.653	-0.092	-0.123	-0.16	
Observations	986	548	438	1,369	759	610	1,369	759	610	
***	p<0.01,	**	p<0.05,	*	p<0.1,	coefficients	and	Standard	Errors	reported

that the effect is negligible, and the coefficients from the OLS and Heckman regressions are insignificant.

Therefore, in summary, I find that for most of the bargaining measures employed in this study except two, there seems to be no significant effect of women's bargaining power on children's English achievement. Where there appears to be a link, such as the case for a woman's relative share of household durable assets or non-farm enterprise assets and children's English achievement, the coefficients are only marginally significant. Second, even the statistically significant coefficients are nearly zero in the ZINB regressions suggesting a negligible change in English scores attributable to changes in women's bargaining power. Even more perplexing is the fact that neither a woman's share of parental education nor the fact that she works outside of the home are statistically significant in explaining children's achievement in English either.

One possible explanation is that a woman's bargaining power is not important in explaining children's English achievement, or if it is there might be challenges related to the quality of the data used in this analysis. First of all, the sample size of about 1,375 observations is small, and given the proportion that have missing test scores in English and mathematics, we find the OLS results in particular are based on a relatively smaller sample size. Even when the issues of selectivity and the over-dispersion of test scores are taken into account and appropriate regression techniques employed, the households that report ownership of assets tend to be even smaller as shown in Table 5.3. This implies that the regression results for the effects of bargaining power are conditioned on whether a household owns the asset in question, since it is only under such circumstances that a woman's relative share of assets can be computed.

Although a much larger data set would have been ideal, I know of no other such data, which could have been used to answer the research question of interest in this chapter. Another avenue was to explore the use of multiple imputation to address the challenges of missing variables. However, we found after inspection that the data did not meet the conditions under which multiple imputation will have been efficient.

5.6 Conclusion

The aim of this study was to determine the effects of a woman's relative bargaining power on the educational achievement of her biological children in dual-headed households in Ghana. The analysis of boys' and girls' test scores entailed the use of a Heckman two stage and a zero-inflated negative binomial regression.

The analyses show no consistent associations of a mother's bargaining power, measured by her relative share of household economic asset ownership, with boys' and girls' achievement in mathematics and English. A woman's share of household durable assets seem to matter in determining boys' Mathematics and English achievement, but the coefficients are only marginally significant at the ten percent level of significance. All other things being equal at the average score, a one-percentage point increase in a mother's share of household durable assets increases a boy's mathematics test score by about 0.10 percentage points and his English test score by about 0.11 percentage points, if all other things are held constant. The ZINB regressions however show a very small effect of a change in a mother's share of household durable assets on tests scores even though the coefficient is statistically significantly different from zero. Considering a mother's share of household durables as a measure of her bargaining power, the results

show that although important, mother's share of household durable assets has a very small positive effect on boys' achievement. The results for girls are not statistically significant for mathematics, and rather mixed for English. In this regards, further research will be required to be able to conclude on the importance of a mother's share of household durable assets in explaining child educational achievement.

A mother's ownership of non-farm enterprise assets seems to matter for boys but not for girls' achievement. This is after controlling for total value of non-farm enterprise assets owned by parents, which does not seem to matter for child achievement. Whereas women seemed to have larger shares of non-farm enterprise assets, the effect of non-farm asset ownership on boys is rather negative. Boy's English and Mathematics achievement gets poorer with increasing shares of mother's non-farm enterprise assets. If the ownership of non-farm enterprise assets were regarded as a measure of a woman's bargaining power within the household, this finding would seem to be in contrast with the literature, which suggests that enhancing the bargaining power of a woman in the household leads to better welfare outcomes for her children (Examples, Lundberg et al 1997, Doss 2006). However, this may be explained by the fact that for most Ghanaian women who work in the informal sector, trading is the most common non-farm enterprise activity they engage in.

The majority of traders spend long hours outside the home and are most unlikely to pay close attention to their children's schooling, nor are they likely to personally invest time in supporting their learning because they spend most of their time away from home. Considering a mother's ownership of non-farm enterprise assets as a measure of bargaining power, it is likely that the negative effects of a mother's reduced presence at

home offsets any positive effects that her increased bargaining power is expected to have on her children's welfare. The effects may be more important for boys than for girls because between the ages of 9 and 15, boys tend to be more adventurous and have a tendency to be wayward in the absence of a mother than girls. This may explain why we find the small negative associations with women's relative share of non-farm enterprise assets.

Lastly, given that the ownership of agricultural land has been highlighted in the literature as an important tool for women's empowerment, (Doss 2006, Oduro et al 2012) this study does not find any significant effects of a woman's agricultural land share with child achievement in English but instead finds that it matters in girls' achievement in mathematics. Again, with no statistically significant coefficients from the ZINB regression, this conclusion is based on limited evidence from the OLS and Heckman regressions, which indicate a marginal level of significance at the 10 percent level. I find no significant effects of a mother's saving share on her children's achievement in either mathematics or English.

To conclude, these results with small coefficients and statistically insignificant results for many measures of bargaining power do not provide convincing evidence of a woman's relative bargaining power being associated with children's educational achievement. Second, where it appears to be the case, the evidence does not necessarily always suggest a stronger association between boys' achievement and mothers bargaining power. This might suggest that women's preferences are more aligned with their sons than daughters as observed in Ethiopia by Fafachamps et al (2009) in relation to household expenditure on private goods).

As with all studies, this study is not without limitations. One major limitation of this study lies, first, with the data. Apart from, the small sample size reduced even further when disaggregated by gender, the analysis on the effects of bargaining power is further affected by the fact that the number of households who own the assets of interest to this study are even smaller. Given that not all households own each asset of interest, the results for the effects of bargaining power on child achievement are conditioned on whether a household owns a particular asset type, which in some cases reduces the number of observations on which the bargaining power analyses are based resulting in a loss of power in the regression analysis. This is more the case considering the small number of household for which there are observations on a woman's relative share of non-farm enterprise assets (337), agricultural land (508) and savings (858) are concerned.

Another limitation of the study lies with its failure to account for a child's own drive reflected in the efforts they make to study and acquire additional skills outside what is taught in the classroom. Although unobserved, a child's own drive can affect their educational outcomes in a significant way. Second, while I control for parental education, it has not been possible to account for differences in parenting styles. It is however known that parents' encouragement or influence are important determinants of children's educational achievement. Consequently, in the light of the limitations outlined, the findings of this study, although important, are at best, an attempt to investigate the associations, rather than causal effects, between bargaining power and child educational achievement.

Given that the ISSER/YALE project is intended to be a panel spanning fifteen years, it is hoped that it will present an opportunity to use information from future rounds of the survey to investigate how changes in women's relative bargaining power may affect changes in child achievement, and thereby obtain added understanding of the ways in which the effects we have found may vary within a dynamic context. However due to time constraints and the non-availability of that data at the time this study was being carried out, that will be the subject for a future study.

6. Conclusion

This thesis exploits the unique opportunities presented by recent household data from Sub Saharan African to revisit the links between intra-household bargaining power and child welfare outcomes. The three empirical studies conducted use measures of women's relative bargaining power based on their involvement in decision-making, experience of domestic violence and relative ownership of economic assets in a bid to shed more light on how children's survival, health and education might be impacted by women's relative bargaining power within the household.

The principal conclusion from these studies is a confirmation of the importance of women's intra-household bargaining power in determining child welfare outcomes as also found in Fafchamps et al, (2009), Lépine and Strobl (2013) and Rawlings and Siddique (2014). The first two studies provide varying degrees of evidence, which suggest that children's survival, health and nutrition outcomes are positively associated with women's intra-household bargaining power measured in various ways. For example, I find, for Ghana that a mother's overall involvement in household decision-making is positively associated with child nutrition outcomes. Similarly, the study of six sub-Saharan African countries provide consistent evidence of a mothers' reported experience of emotional, physical and (or) sexual violence from their intimate partner being positively associated with under-weight, wasting, and reported diarrhoea, fever or cough in the two weeks before the survey.

Second, the first empirical study corroborates the conclusions from studies by Basu (2006) and Gitter and Barham (2008) for example, that better child welfare outcomes are not necessarily positively associated with being in a household where a woman

wields sole bargaining power relative to her partner, but with being in a household where the power balance between women and their partners is equal across several spheres of decision-making. In this regard, it is worth promoting policies which raise women's status or empower women in communities where women lack recognition to enable them to engage with men in balanced decision-making. Further, the study adds to the limited evidence in the literature that balanced power between men and women's is most child-welfare enhancing.

Further, from the findings of the second empirical study, limited evidence of the total effects of a mother's experience of domestic violence on infant mortality and stunting were found. This may suggest that a mother's exposure to domestic violence has varying impacts on child survival and nutrition across countries. A related observation is therefore the need to be mindful of country level differences in the relationships between women's bargaining power and child welfare outcomes.

Finally, our findings seem to suggest very weak links between a woman's bargaining power and child education outcomes. It appears, based on the data available, that a child's individual characteristics, school and location factors are more important predictors of their achievement in mathematics and English than their mother's relative bargaining power.

These conclusions are analytically robust. None-the-less, due to constraints already identified in the substantive chapters, the following recommendations are made regarding possible future research which might further extend our understanding of the relationships between women's intra-household bargaining power and child welfare outcomes within a developing country context.

First, due to data constraints, few of the studies on the impact of intra-household women's bargaining power on children's welfare outcomes are conducted with a dynamic dimension to the analyses. In this regard, it will be interesting to gain more insights into how women's bargaining power may change over time and what drives those changes. This is still an area, which could be potentially explored with the availability of new waves to obtain paneled data. The ISSEY/YALE data is one such possible data set with the information required to carry out such analyses on women's bargaining power and child welfare outcomes in the near future. Also, in the absence of panel data, the recent availability of DHS data with the required information, still presents opportunities to carry out cohort studies based on repeated surveys with similar data on women's bargaining power.

In this regard, I wish to propose the periodic collection of quality nationally representative quantitative and qualitative data on a variety of constructs and measures of women's intra-household bargaining power as well as household, community and child characteristics, which can facilitate additional understanding of the links between a mothers relative bargaining power and child welfare outcomes. These in my opinion, will provide a basis for richer future research and insights on sub-Saharan Africa, which have proven beyond the scope of this thesis.

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Appendices

Appendix 3: Appendices to chapter 3

Table A3. 1: Principal Components Analysis for Bargaining Power Index

Principal components/correlation	Number of Obs	=	2154
	Number of comp.	=	7
	Trace	=	7
Rotation: (unrotated = principal)	Rho	=	1.0000

<i>Component</i>	<i>Eigenvalue</i>	<i>Difference</i>	<i>Proportion</i>	<i>Cumulative</i>
Comp 1	2.61	1.64	0.373	0.373
Comp 2	0.97	0.05	0.139	0.512
Comp 3	0.92	0.12	0.131	0.643
Comp 4	0.80	0.18	0.114	0.757
Comp 5	0.62	0.01	0.089	0.846
Comp 6	0.61	0.14	0.087	0.933
Comp 7	0.47	-	0.067	1.000

Principal Components (eigenvectors)

<i>Decision Variable</i>	<i>Comp 1</i>	<i>Comp 2</i>	<i>Comp 3</i>	<i>Comp 4</i>	<i>Unexplained</i>
Large purchase	0.44	-0.38	-0.17	0.2	0.29
no of children	0.36	0.25	0.18	-0.74	0.14
health	0.43	-0.1	-0.35	0.19	0.4
daily purchases	0.45	0.05	-0.18	0.21	0.4
visits to fam.	0.41	0.28	-0.17	-0.26	0.4
his earnings	0.24	-0.64	0.64	-0.1	0.63
her earnings	0.25	0.55	0.59	0.5	0.02

Scoring coefficients

Sum of squares (column-loading) = 1

	<i>Comp 1</i>	<i>Comp 2</i>	<i>Comp 3</i>	<i>Comp 4</i>
Large purchases	0.44	-0.38	-0.17	0.2
no of children	0.36	0.25	0.18	-0.74
health	0.42	-0.1	-0.35	0.19
daily purchases	0.45	0.05	-0.18	0.21
visits to fam.	0.41	0.28	-0.17	-0.26
his earnings	0.24	-0.64	0.64	-0.1
her earnings	0.25	0.55	0.59	0.5

Source: author's calculation based on GDHS 2008, data

Table A3. 2: Modelling Determinants of HFA

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	HFA	HFA	HFA	HFA	HFA	HFA
Child's age (months)	-0.03*** (0.002)	-0.03*** (0.002)	-0.03*** (0.002)	-0.03*** (0.002)	-0.03*** (0.002)	-0.03*** (0.002)
Low birth weight =1	-0.29*** (0.102)	-0.25** (0.102)	-0.25** (0.099)	-0.25** (0.099)	-0.33*** (0.099)	-0.33*** (0.099)
Male Child=1	-0.13* (0.074)	-0.11 (0.073)	-0.12* (0.073)	-0.13* (0.072)	-0.12* (0.071)	-0.13* (0.071)
Birth order	0.01 (0.019)	-0.01 (0.029)	0.02 (0.033)	0.02 (0.033)	0.02 (0.033)	0.02 (0.033)
Recent Diarrhoea	-0.16* (0.090)	-0.08 (0.089)	-0.08 (0.089)	-0.08 (0.090)	-0.07 (0.088)	-0.06 (0.089)
Recent fever or cough	-0.04 (0.080)	-0.05 (0.078)	-0.04 (0.078)	-0.04 (0.077)	-0.10 (0.074)	-0.10 (0.075)
Mother's Age (years)		0.02* (0.009)	0.01 (0.009)	0.01 (0.009)	0.01 (0.009)	0.00 (0.009)
Mothers Educ. (years)		0.02** (0.009)	0.01 (0.011)	0.01 (0.011)	0.00 (0.013)	0.00 (0.014)
Mother's BMI		0.05*** (0.000)	0.04*** (0.000)	0.04*** (0.000)	0.04*** (0.000)	0.04*** (0.000)
Mother Pregnant		-0.11 (0.117)	-0.12 (0.117)	-0.11 (0.117)	-0.10 (0.116)	-0.10 (0.117)
Mother works		0.20 (0.193)	0.24 (0.188)	0.24 (0.188)	0.33* (0.189)	0.33* (0.189)
Woman Works# earns less		-0.23** (0.111)	-0.23** (0.111)	-0.23** (0.111)	-0.31*** (0.114)	-0.32*** (0.114)
Woman Works# earns more		0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)
Male hh head			0.06 (0.095)	0.07 (0.094)	0.05 (0.094)	0.05 (0.094)
Household size			-0.02 (0.022)	-0.02 (0.022)	-0.01 (0.022)	-0.01 (0.022)
Polygamy			0.09 (0.272)	0.12 (0.270)	0.21 (0.288)	0.24 (0.287)
Polygamy X wife no.			-0.19 (0.185)	-0.21 (0.181)	-0.30 (0.187)	-0.29 (0.187)
Polygamy X wife rank			0.14 (0.124)	0.14 (0.123)	0.13 (0.120)	0.10 (0.123)
Dependency ratio			0.10 (0.286)	0.12 (0.285)	0.22 (0.286)	0.23 (0.287)
Richest HH			0.47*** (0.180)	0.43** (0.180)	0.51** (0.206)	0.50** (0.208)
Rich HH			0.22* (0.126)	0.19 (0.126)	0.28* (0.155)	0.27* (0.157)

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A3. 2: Modelling Determinants of HFA (continued)

VARIABLES	(1) HFA	(2) HFA	(3) HFA	(4) HFA	(5) HFA	(6) HFA
<i>Middle income HH</i>			0.14 (0.128)	0.11 (0.129)	0.28* (0.146)	0.27* (0.148)
<i>Poor HH</i>			-0.06 (0.114)	-0.09 (0.114)	-0.03 (0.119)	-0.04 (0.121)
<i>Poorest HH = 0</i>			-	-	-	-
<i>Flush toilet</i>			0.12 (0.183)	0.11 (0.184)	0.05 (0.174)	0.04 (0.175)
<i>Clean water =1</i>			0.01 (0.133)	0.02 (0.132)	0.00 (0.137)	-0.00 (0.138)
<i>Muslim</i>				-0.02 (0.116)	-0.16 (0.121)	-0.16 (0.120)
<i>Traditionalist</i>				-0.08 (0.135)	-0.19 (0.167)	-0.18 (0.168)
<i>Not religious</i>				-0.45** (0.198)	-0.47** (0.182)	-0.47** (0.182)
<i>Urban=1</i>					-0.10 (0.130)	-0.10 (0.130)
<i>North =1</i>					0.25 (0.212)	0.23 (0.213)
<i>Father's Education (years)</i>						0.01 (0.009)
<i>Father's Age</i>						0.00 (0.004)
<i>District Fixed Effects</i>					YES	YES
<i>Constant</i>	-0.07 (0.111)	-1.90*** (0.284)	-1.56*** (0.342)	-1.53*** (0.341)	-1.52*** (0.441)	-1.55*** (0.448)
<i>Observations</i>	2,154	2,154	2,154	2,154	2,154	2,154
<i>R-square</i>	0.098	0.137	0.148	0.151	0.206	0.206

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A3. 3: Modelling Determinants of WFA

VARIABLES	(1) WFA	(2) WFA	(3) WFA	(4) WFA	(5) WFA	(6) WFA
Child's age (months)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)
Low birth weight =1	-0.41*** (0.085)	-0.37*** (0.087)	-0.37*** (0.088)	-0.36*** (0.088)	-0.43*** (0.087)	-0.43*** (0.088)
Male Child=1	-0.10* (0.055)	-0.07 (0.052)	-0.08 (0.051)	-0.08 (0.051)	-0.08 (0.051)	-0.08 (0.051)
Birth order	-0.01 (0.013)	0.00 (0.021)	0.03 (0.025)	0.03 (0.025)	0.02 (0.024)	0.02 (0.024)
Recent Diarrhoea	-0.21*** (0.074)	-0.13* (0.072)	-0.13* (0.070)	-0.13* (0.071)	-0.13* (0.073)	-0.13* (0.073)
Recent fever or cough	-0.14** (0.066)	-0.14** (0.064)	-0.14** (0.064)	-0.13** (0.064)	-0.16** (0.063)	-0.16** (0.063)
Mother's Age (years)		0.00 (0.007)	-0.00 (0.007)	-0.00 (0.007)	-0.00 (0.007)	-0.01 (0.007)
Mothers Educ. (years)		0.03*** (0.007)	0.01* (0.009)	0.01 (0.009)	0.00 (0.009)	0.00 (0.009)
Mother's BMI		0.05*** (0.000)	0.05*** (0.000)	0.04*** (0.000)	0.05*** (0.000)	0.05*** (0.000)
Mother Pregnant		-0.07 (0.088)	-0.07 (0.086)	-0.07 (0.086)	0.01 (0.080)	0.02 (0.081)
Mother works		0.09 (0.136)	0.12 (0.131)	0.09 (0.130)	0.07 (0.127)	0.08 (0.128)
Woman Works# earns less		-0.08 (0.085)	-0.07 (0.086)	-0.07 (0.087)	-0.06 (0.084)	-0.06 (0.084)
Woman Works# earns more		0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)	0.00 (0.000)
Male hh head			0.05 (0.071)	0.07 (0.070)	0.07 (0.068)	0.06 (0.069)
Household size			-0.02 (0.017)	-0.01 (0.017)	-0.00 (0.016)	-0.00 (0.016)
Polygamy			-0.17 (0.214)	-0.15 (0.213)	-0.04 (0.222)	-0.01 (0.222)
Polygamy X wife no.			-0.17 (0.161)	-0.18 (0.158)	-0.26* (0.144)	-0.26* (0.147)
Polygamy X wife rank			0.23* (0.125)	0.22* (0.124)	0.23* (0.119)	0.20 (0.121)
Dependency ratio			-0.03 (0.232)	-0.02 (0.230)	-0.03 (0.225)	-0.04 (0.224)
Richest HH			0.17 (0.139)	0.16 (0.141)	0.23 (0.161)	0.23 (0.163)
Rich HH			0.15 (0.111)	0.13 (0.112)	0.17 (0.117)	0.17 (0.120)

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A3. 3: Modelling Determinants of WFA (continued)

<i>VARIABLES</i>	(1)	(2)	(3)	(4)	(5)	(6)
	<i>WFA</i>	<i>WFA</i>	<i>WFA</i>	<i>WFA</i>	<i>WFA</i>	<i>WFA</i>
<i>Middle income HH</i>			0.08 (0.095)	0.07 (0.097)	0.14 (0.098)	0.15 (0.100)
<i>Poor HH</i>			0.00 (0.088)	-0.01 (0.090)	-0.01 (0.096)	-0.01 (0.097)
<i>Poorest HH = 0</i>			-	-	-	-
<i>Flush toilet</i>			0.24* (0.132)	0.23* (0.132)	0.19 (0.127)	0.19 (0.127)
<i>Clean water =1</i>			0.03 (0.105)	0.03 (0.105)	0.05 (0.105)	0.04 (0.105)
<i>Muslim</i>				-0.11 (0.082)	-0.09 (0.079)	-0.09 (0.081)
<i>Traditionalist</i>				-0.04 (0.109)	0.10 (0.140)	0.09 (0.139)
<i>Not religious</i>				-0.25* (0.151)	-0.21 (0.148)	-0.22 (0.149)
<i>Urban=1</i>					0.05 (0.099)	0.04 (0.100)
<i>North =1</i>					-0.06 (0.151)	-0.07 (0.150)
<i>Father's Education (years)</i>						-0.00 (0.008)
<i>Father's Age</i>						0.00 (0.003)
<i>District fixed effects</i>					YES	YES
<i>Constant</i>	-0.29*** (0.088)	-1.82*** (0.206)	-1.61*** (0.250)	-1.55*** (0.252)	-1.65*** (0.315)	-1.68*** (0.320)
<i>Observations</i>	2,154	2,154	2,154	2,154	2,154	2,154
<i>R-squared</i>	0.039	0.094	0.104	0.106	0.176	0.177

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A3. 4 Effects of Women's Bargaining Power on Child Nutrition Outcomes

VARIABLES	HFA	WFA	WFH
<i>Child's age (months)</i>	-0.03*** (0.002)	-0.01*** (0.002)	0.01*** (0.002)
<i>Low birth weight =1</i>	-0.33*** (0.099)	-0.43*** (0.087)	-0.35*** (0.095)
<i>Male Child=1</i>	-0.13* (0.071)	-0.08 (0.051)	-0.04 (0.062)
<i>Birth order</i>	0.02 (0.033)	0.02 (0.024)	0.00 (0.030)
<i>Recent Diarrhoea</i>	-0.07 (0.088)	-0.13* (0.073)	-0.14* (0.084)
<i>Recent fever or cough</i>	-0.09 (0.075)	-0.15** (0.062)	-0.14** (0.070)
<i>Mother's Age (yrs.)</i>	0.01 (0.009)	-0.00 (0.007)	-0.01 (0.008)
<i>Mothers Educ. (yrs.)</i>	0.00 (0.013)	-0.00 (0.009)	-0.00 (0.010)
<i>Mother's BMI</i>	0.04*** (0.000)	0.05*** (0.000)	0.04*** (0.000)
<i>Mother Pregnant</i>	-0.10 (0.116)	0.00 (0.081)	0.09 (0.093)
<i>Mother works</i>	0.31 (0.191)	-0.01 (0.129)	-0.24* (0.133)
<i>Mother works x earns less</i>	-0.30*** (0.114)	-0.03 (0.084)	0.19** (0.094)
<i>Male hh head</i>	0.05 (0.094)	0.06 (0.068)	0.06 (0.083)
<i>Household size</i>	-0.01 (0.022)	-0.00 (0.016)	0.01 (0.016)
<i>Polygamy</i>	0.21 (0.288)	-0.05 (0.221)	-0.23 (0.235)
<i>Polygamy X wifeno</i>	-0.30 (0.187)	-0.26* (0.145)	-0.11 (0.164)
<i>Polygamy X wiferank</i>	0.13 (0.120)	0.23** (0.119)	0.22* (0.127)

Table continued on next page

*Table A3.4: Effects of Women's Bargaining Power on Child Nutrition Outcomes
(continued)*

	<i>HFA</i>	<i>WFA</i>	<i>WFH</i>
<i>VARIABLES</i>			
<i>Dependency ratio</i>	0.22 (0.286)	-0.05 (0.225)	-0.17 (0.248)
<i>Richest HH</i>	0.51** (0.206)	0.22 (0.159)	-0.11 (0.172)
<i>Rich HH</i>	0.27* (0.154)	0.14 (0.119)	-0.01 (0.132)
<i>Middle income HH</i>	0.27* (0.147)	0.13 (0.099)	-0.04 (0.113)
<i>Poor HH</i>	-0.03 (0.119)	-0.02 (0.096)	-0.01 (0.111)
<i>Poorest HH = 0</i>	-	-	-
<i>Flush toilet</i>	0.04 (0.174)	0.17 (0.125)	0.21 (0.149)
<i>Clean water =1</i>	-0.00 (0.138)	0.03 (0.105)	0.04 (0.124)
<i>Muslim</i>	-0.16 (0.122)	-0.08 (0.080)	0.01 (0.102)
<i>Traditionalist</i>	-0.19 (0.167)	0.09 (0.140)	0.27* (0.145)
<i>Not religious</i>	-0.47** (0.183)	-0.21 (0.147)	0.08 (0.148)
<i>Urban=1</i>	-0.10 (0.130)	0.05 (0.099)	0.12 (0.131)
<i>North =1</i>	0.22 (0.218)	-0.15 (0.148)	-0.41** (0.177)
<i>BPINDEX_{PCA}</i>	0.02 (0.027)	0.05*** (0.021)	0.06*** (0.022)
<i>District fixed effects</i>	Y	Y	Y
<i>Constant</i>	-1.48*** (0.439)	-1.50*** (0.314)	-1.20*** (0.300)
<i>Observations</i>	2,154	2,154	2,154
<i>R-squared</i>	0.206	0.180	0.147

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

Table A3. 5: Effects of Women's bargaining power on Nutrition - IV

	(1)	(2)	(3)	(4)	(5)	(6)
<i>VARIABLES</i>	<i>First_HFA</i>	<i>HFA</i>	<i>First_WFA</i>	<i>WFA</i>	<i>First_WFH</i>	<i>WFH</i>
	<i>pc1</i>	<i>HFA</i>	<i>pc1</i>	<i>WFA</i>	<i>pc1</i>	<i>WFH</i>
<i>Child's age (months)</i>	-0.000645 (0.00197)	-0.03*** (0.002)	-0.000645 (0.00197)	-0.01*** (0.002)	-0.000645 (0.00197)	0.01*** (0.002)
<i>Low birth weight =1</i>	-0.0116 (0.0893)	-0.33*** (0.100)	-0.0116 (0.0893)	-0.43*** (0.072)	-0.0116 (0.0893)	-0.35*** (0.079)
<i>Male Child=1</i>	0.0593 (0.0629)	-0.12 (0.079)	0.0593 (0.0629)	-0.05 (0.057)	0.0593 (0.0629)	-0.00 (0.063)
<i>Birth order</i>	-0.0204 (0.0283)	0.01 (0.034)	-0.0204 (0.0283)	0.01 (0.024)	-0.0204 (0.0283)	-0.00 (0.027)
<i>Recent Diarrhoea</i>	-0.119 (0.0815)	-0.04 (0.120)	-0.119 (0.0815)	-0.11 (0.086)	-0.119 (0.0815)	-0.14 (0.095)
<i>Recent fever or cough</i>	-0.0980 (0.0711)	-0.07 (0.103)	-0.0980 (0.0711)	-0.13* (0.074)	-0.0980 (0.0711)	-0.13* (0.081)
<i>Mother's Age (years)</i>	0.0359*** (0.00769)	-0.01 (0.024)	0.0359*** (0.00769)	-0.01 (0.017)	0.0359*** (0.00769)	-0.00 (0.019)
<i>Mothers Educ. (years)</i>	0.0472*** (0.0104)	-0.02 (0.034)	0.0472*** (0.0104)	-0.01 (0.024)	0.0472*** (0.0104)	-0.01 (0.027)
<i>Mother Pregnant</i>	0.0440 (0.106)	-0.15 (0.122)	0.0440 (0.106)	-0.01 (0.087)	0.0440 (0.106)	0.10 (0.096)
<i>Mother works</i>	1.402*** (0.141)	-0.35 (0.912)	1.402*** (0.141)	-0.43 (0.655)	1.402*** (0.141)	-0.39 (0.720)
<i>Woman Works# earns less</i>	-0.463*** (0.0934)	-0.05 (0.309)	-0.463*** (0.0934)	0.12 (0.222)	-0.463*** (0.0934)	0.22 (0.244)
<i>Woman Works# earns more</i>	0 (0)	0.00 (0.000)	0 (0)	0.00 (0.000)	0 (0)	0.00 (0.000)
<i>Male hh head</i>	0.0316 (0.0866)	0.05 (0.097)	0.0316 (0.0866)	0.06 (0.070)	0.0316 (0.0866)	0.06 (0.077)
<i>Household size</i>	-0.0413*** (0.0159)	0.01 (0.032)	-0.0413*** (0.0159)	0.00 (0.023)	-0.0413*** (0.0159)	0.00 (0.025)
<i>Polygamy</i>	0.0466 (0.227)	-0.11 (0.253)	0.0466 (0.227)	-0.19 (0.182)	0.0466 (0.227)	-0.19 (0.200)
<i>Polygamy X wife no.</i>	-0.0171 (0.175)	-0.20 (0.196)	-0.0171 (0.175)	-0.13 (0.141)	-0.0171 (0.175)	-0.01 (0.154)
<i>Polygamy X wife rank</i>	-0.156 (0.120)	0.31* (0.165)	-0.156 (0.120)	0.28** (0.118)	-0.156 (0.120)	0.15 (0.130)
<i>Dependency ratio</i>	0.363 (0.252)	0.12 (0.359)	0.363 (0.252)	-0.16 (0.258)	0.363 (0.252)	-0.28 (0.283)

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A3. 5: Effects of Women's bargaining power on Nutrition - IV (continued)

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>First stage _HFA</i>	<i>HFA</i>	<i>First_WFA</i>	<i>WFA</i>	<i>First_WFH</i>	<i>WFH</i>
<i>VARIABLES</i>	<i>pc1</i>	<i>HFA</i>	<i>pc1</i>	<i>WFA</i>	<i>pc1</i>	<i>WFH</i>
<i>Richest HH</i>	0.0432 (0.186)	0.64*** (0.209)	0.0432 (0.186)	0.27* (0.150)	0.0432 (0.186)	-0.13 (0.165)
<i>Rich HH</i>	0.383*** (0.141)	0.17 (0.288)	0.383*** (0.141)	0.07 (0.207)	0.383*** (0.141)	-0.04 (0.227)
<i>Middle income HH</i>	0.153 (0.127)	0.31* (0.171)	0.153 (0.127)	0.13 (0.123)	0.153 (0.127)	-0.08 (0.135)
<i>Poor HH</i>	0.158 (0.101)	-0.02 (0.150)	0.158 (0.101)	0.01 (0.108)	0.158 (0.101)	0.02 (0.119)
<i>Poorest HH = 0</i>	-	-	-	-	-	-
<i>Flush toilet</i>	0.336** (0.155)	-0.12 (0.281)	0.336** (0.155)	0.09 (0.202)	0.336** (0.155)	0.20 (0.222)
<i>Clean water =1</i>	0.206* (0.119)	-0.14 (0.186)	0.206* (0.119)	-0.02 (0.133)	0.206* (0.119)	0.07 (0.147)
<i>Urban=1</i>	-0.0741 (0.111)	-0.09 (0.139)	-0.0741 (0.111)	0.01 (0.100)	-0.0741 (0.111)	0.07 (0.110)
<i>North =1</i>	1.947*** (0.296)	-0.50 (1.241)	1.947*** (0.296)	-0.53 (0.891)	1.947*** (0.296)	-0.47 (0.979)
<i>Matrilineal</i>	0.0161 (0.0995)		0.0161 (0.0995)		0.0161 (0.0995)	
<i>Christian</i>	0.0984 (0.149)		0.0984 (0.149)		0.0984 (0.149)	
<i>Muslim</i>	-0.0734 (0.170)		-0.0734 (0.170)		-0.0734 (0.170)	
<i>Traditionalist</i>	0.0792 (0.193)		0.0792 (0.193)		0.0792 (0.193)	
<i>Not religious = 0</i>	-		-		-	
BPINDEX_{pca}		0.45 (0.630)		0.30 (0.453)		0.12 (0.497)
<i>Constant</i>	-2.712*** (0.511)	-0.68 (1.744)	-2.712*** (0.511)	-1.05 (1.253)	-2.712*** (0.511)	-1.04 (1.376)
<i>District Fixed Effects</i>	Y	Y	Y	Y	Y	Y
<i>Observations</i>	2,154	2,154	2,154	2,154	2,154	2,154
<i>R-squared</i>	0.268	0.070	0.268	0.098	0.268	0.145
<i>IV F-stat</i>		0.785		0.785		0.785
<i>Durbin pval</i>		0.457		0.581		0.931
***	p<0.01,	**	p<0.05,	*	p<0.1	Standard errors in parentheses

Table A3. 6: Separate Spheres: Joint verses sole decision-making (Dependent Variable:

WFH)

<i>Sphere and type of decision:</i>	(1) Spending her income	(2) Spending his income	(3) Visits to her family	(4) Number of children
<i>Woman alone</i>	0.04 (0.118)	0.28** (0.136)	0.21** (0.102)	0.37*** (0.117)
<i>Both</i>	0.06 (0.129)	0.12 (0.077)	0.16** (0.079)	0.24*** (0.081)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>District Fixed Effects</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	2,154	2,154	2,154	2,154
<i>R-squared</i>	0.144	0.149	0.146	0.149

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ Standard errors in parentheses

Appendix 4: Appendices to Chapter 4:

Figure A4-1 : Domestic violence by type based on questions from Questionnaire

	DV04	A	Did your (last) (husband/partner) ever:	EVER	
Emotional		a)	say or do something to humiliate you in front of others?	YES	1
				NO	2
		b)	threaten to hurt or harm you or someone you care about?	YES	1
				NO	2
		c)	insult you or make you feel bad about yourself?	YES	1
				NO	2
	DV05	A	Did your (last) (husband/partner) ever do any of the following things to you:	EVER	
Physical		a)	push you, shake you, or throw something at you?	YES	1
				NO	2
		b)	slap you?	YES	1
				NO	2
		c)	twist your arm or pull your hair?	YES	1
				NO	2
		d)	punch you with his fist or with something that could hurt you?	YES	1
				NO	2
		e)	kick you, drag you, or beat you up?	YES	1
				NO	2
		f)	try to choke you or burn you on purpose?	YES	1
				NO	2
		g)	threaten or attack you with a knife, gun, or other weapon?	YES	1
				NO	2
Sexual		h)	physically force you to have sexual intercourse with him when you did not want to?	YES	1
				NO	2
		i)	physically force you to perform any other sexual acts you did not want to?	YES	1
				NO	2
		j)	force you with threats or in any other way to perform sexual acts you did not want to?	YES	1
				NO	2

Source: Excerpt from Domestic Violence Module, DHS Phase 6. [http://dhsprogram.com/publications/publication-](http://dhsprogram.com/publications/publication-dhsqmp-dhs-questionnaires-and-manuals.cfm)

[dhsqmp-dhs-questionnaires-and-manuals.cfm](http://dhsprogram.com/publications/publication-dhsqmp-dhs-questionnaires-and-manuals.cfm)

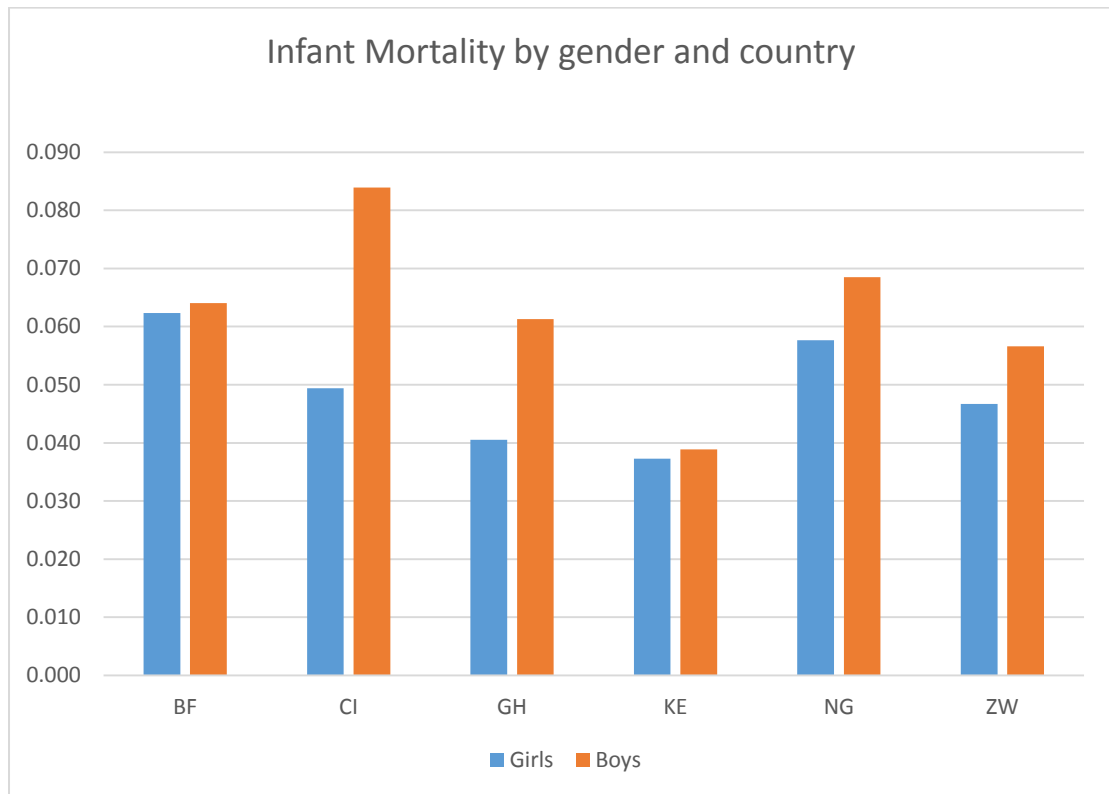
Figure A4-2: Incidence of infant mortality by country

Table A4. 7: Percentage of women who think wife beating is justified by wealth quintile, location and level of education

	<u>Wealth Quintile</u>					<u>Location</u>		<u>Level of Education completed</u>			
	Poorest	Poorer	Middle	Richer	Richest	Urban	Rural	None	Primary	Secondary	Higher
Goes out without telling husband	38	36	34	26	15	20	34	37	30	20	9
Neglects children	36	36	35	28	18	22	35	36	33	23	11
Argues with husband	34	33	31	25	14	19	32	35	28	17	7
Refuses sex	30	27	25	18	9	13	26	28	23	13	6
Burns food	18	18	15	10	5	8	16	17	13	8	3
No. of reasons	1.58	1.50	1.40	1.07	0.61	0.81	1.43	1.54	1.27	0.81	0.35

Source: Author's calculations based on data from various Demographic and Health Surveys (2008-2013) * Mean proportions converted to percentages

Table A4. 8: Direct Effects of Domestic Violence on infant mortality

VARIABLES	BF	CI	GH	KE	NG	ZW
Emotional Violence	1.29 (0.238)	1.11 (0.316)	1.11 (0.463)	1.99* (0.809)	1.01 (0.152)	0.81 (0.262)
Physical violence	1.14 (0.215)	1.18 (0.297)	2.25** (0.788)	1.09 (0.406)	0.93 (0.130)	0.87 (0.211)
Sexual violence	1.60 (0.790)	1.30 (0.585)	1.46 (0.894)	0.93 (0.462)	1.15 (0.242)	0.79 (0.260)
Observations	4,358	1,591	991	1,366	8,580	2,178
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, (exponents of logistic coefficients reported)						

Table A4. 9. : Determinants of Infant mortality

VARIABLES	(1) BF	(2) CI	(3) GH	(4) KE	(5) NG	(6) ZW
Male child	1.04 (0.136)	1.83*** (0.422)	1.86* (0.641)	1.05 (0.362)	1.21* (0.119)	1.08 (0.238)
Birth order number	1.08 (0.064)	1.05 (0.090)	1.07 (0.138)	1.00 (0.158)	1.18*** (0.042)	1.31** (0.163)
Born as multiple set	6.11*** (1.358)	3.25*** (1.148)	3.53** (1.929)	4.68** (3.454)	4.03*** (0.808)	4.20*** (2.070)
Low birthweight	1.54*** (0.257)	1.52 (0.430)	1.53 (0.619)	1.63 (0.713)	1.47*** (0.184)	1.75* (0.508)
Year of birth	0.91* (0.045)	1.03 (0.087)	0.99 (0.115)	0.97 (0.120)	0.92** (0.032)	1.00 (0.082)
Mother's current age	0.97 (0.019)	1.01 (0.029)	1.04 (0.040)	1.00 (0.046)	1.01 (0.013)	0.97 (0.031)
Mother's education (years)	1.00 (0.037)	0.92 (0.057)	1.06 (0.057)	1.07 (0.068)	0.94*** (0.015)	0.97 (0.047)
Mother's Height-for-age (z)	0.86** (0.058)	0.93 (0.105)	1.00 (0.160)	0.81 (0.136)	0.94 (0.046)	0.93 (0.104)

Table continued on next page

Table A4.3: Determinants of Infant mortality (continued)

VARIABLES	(1) BF	(2) CI	(3) GH	(4) KE	(5) NG	(6) ZW
Rural	1.01 (0.224)	1.17 (0.446)	1.02 (0.532)	0.89 (0.575)	0.96 (0.134)	1.25 (0.459)
Breastfeeding mother	0.09*** (0.022)	0.07*** (0.019)	0.02*** (0.013)	0.01*** (0.006)	0.03*** (0.005)	0.02*** (0.007)
Home Delivery = 0	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)
Public/Govt facility Delivery	0.77* (0.119)	0.58** (0.149)	0.74 (0.301)	0.75 (0.326)	0.69** (0.103)	0.94 (0.240)
Private facility Delivery	1.00 (0.000)	1.16 (0.694)	0.81 (0.583)	1.69 (0.973)	1.00 (0.180)	1.00 (0.000)
Other Facility Delivery	3.76** (2.220)	0.56 (0.592)	6.71** (5.770)	29.36*** (28.834)	6.90*** (1.834)	0.87 (0.389)
Man's Education (years)	0.98 (0.029)	0.96 (0.033)	0.92* (0.043)	0.93 (0.052)	1.03** (0.013)	1.00 (0.045)
Number of other wives/partners	1.94*** (0.346)	1.39 (0.415)	2.27 (1.293)	1.40 (0.855)	2.29*** (0.328)	1.42 (0.570)

Table continued on next page

Table A4.3: Determinants of Infant mortality (continued)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	BF	CI	GH	KE	NG	ZW
Respondent's rank among wives	1.36 (0.272)	0.90 (0.368)	0.51 (0.464)	1.11 (0.930)	0.89 (0.174)	1.94 (1.079)
Number of household members	0.82*** (0.030)	0.90** (0.044)	0.86 (0.083)	0.76** (0.095)	0.70*** (0.022)	0.79*** (0.057)
Wealth index = 2, Poorer	1.44* (0.279)	0.95 (0.302)	0.53 (0.296)	1.55 (0.849)	1.06 (0.147)	1.31 (0.410)
Wealth index = 3, Middle	1.21 (0.251)	0.87 (0.300)	1.06 (0.630)	1.63 (0.950)	0.86 (0.147)	1.11 (0.396)
Wealth index = 4, Richer	1.00 (0.223)	1.95 (0.814)	1.48 (1.020)	1.22 (0.763)	0.92 (0.186)	1.76 (0.699)
Wealth index = 5, Richest	0.84 (0.279)	0.94 (0.565)	1.15 (1.009)	0.68 (0.619)	0.76 (0.201)	0.73 (0.434)
Constant	2.39 (1.401)	0.60 (0.667)	3.45 (5.340)	4.87 (7.420)	12.45*** (6.473)	1.44 (1.704)
Observations	4,358	1,591	991	1,366	8,580	2,178

*** p<0.01, ** p<0.05, * p<0.1, Standard errors in parentheses (exponents of logistic coefficients reported)

Appendix 5: Appendices to Chapter 5

Table A5. 1: Disaggregated descriptive statistics

<i>Variable</i>	<i>All</i>	<i>Boys</i>	<i>Girls</i>
<i>Enrol</i>	0.96	0.96	0.95
<i>SAGE2</i>	0.17	0.16	0.18
<i>SAGE</i>	0.63	0.63	0.64
<i>yrsch2</i>	3.73	3.69	3.79
<i>Math</i>	4.74	4.80	4.67
<i>MathP</i>	59.26	59.99	58.37
<i>English</i>	4.29	4.19	4.41
<i>EnglishP</i>	53.65	52.43	55.15
<i>Raven</i>	5.60	5.67	5.52
<i>RavenP</i>	46.70	47.26	46.01
<i>D_span</i>	6.28	6.26	6.30
<i>D_spanP</i>	41.86	41.74	42.02

Source: author's calculation based on the 2009/2010 ISSER/Yale Ghana household survey data

Table A5. 10: Determinants of Mathematics Scores (2-step Heckman)

VARIABLES	<i>All</i>		<i>Boys</i>		<i>Girls</i>	
	(1)	(2)	(1)	(2)	(1)	(2)
<i>Girl child = 1</i>	-0.23 (2.790)	-0.04 (0.079)	-	-	-	-
<i>Child Age (years)</i>	0.94 (1.184)	0.00 (0.047)	1.96 (1.340)	-0.05 (0.062)	0.71 (1.157)	0.08 (0.076)
<i>Schooling for age</i>	3.14 (8.263)	-0.13 (0.362)	-5.46 (12.252)	-0.22 (0.497)	17.93*** (4.895)	-0.09 (0.565)
<i>Years of schooling child</i>		0.18** (0.070)		0.25*** (0.096)		0.09 (0.109)
<i>Raven score</i>	2.09*** (0.570)	-0.00 (0.017)	1.40* (0.785)	0.01 (0.023)	2.76*** (0.475)	-0.02 (0.026)
<i>Digit-Span test score</i>	0.54 (0.678)	0.05*** (0.017)	0.76 (0.902)	0.05** (0.023)	0.99* (0.545)	0.05* (0.025)
<i>Parents total years of schooling</i>	-0.20 (0.653)	0.00 (0.020)	-0.83 (0.905)	0.02 (0.028)	0.16 (0.530)	-0.01 (0.030)
<i>Mother's Age (years)</i>	-0.22 (0.280)	0.00 (0.007)	-0.35 (0.372)	-0.00 (0.010)	0.02 (0.242)	0.01 (0.011)
<i>Father's Age (years)</i>	0.01 (0.226)	-0.00 (0.006)	0.04 (0.300)	0.00 (0.008)	-0.08 (0.193)	-0.01 (0.008)
<i>Educ hhh (yrs)</i>	-0.16 (1.062)	0.03 (0.030)	0.12 (1.394)	0.03 (0.042)	-0.08 (0.879)	0.03 (0.046)
<i>Female hhh =1</i>	-1.36 (11.710)	0.32 (0.429)	-4.95 (15.698)	0.62 (0.562)	2.85 (10.273)	-0.22 (0.659)
<i>HH Consumption Quintile = 2</i>	-9.61* (5.300)	0.25** (0.117)	-5.99 (6.111)	0.08 (0.161)	-9.85* (5.410)	0.42** (0.177)
<i>HH Consumption Quintile = 3</i>	-14.52** (7.264)	0.58*** (0.124)	-10.83 (7.336)	0.36** (0.171)	-10.80 (7.657)	0.80*** (0.187)
<i>HH Consumption Quintile = 4</i>	-9.91 (6.477)	0.44*** (0.125)	-3.43 (7.049)	0.30* (0.171)	-10.93* (6.267)	0.55*** (0.191)
<i>HH Consumption Quintile = 5</i>	-8.54 (6.427)	0.43*** (0.129)	-3.19 (7.133)	0.25 (0.177)	-10.52 (6.825)	0.65*** (0.198)
<i>HH size</i>	-1.20 (0.891)	0.07*** (0.017)	-1.05 (1.108)	0.07*** (0.024)	-0.93 (0.698)	0.05** (0.025)
<i>Muslim =1</i>	-10.69** (5.442)	0.41*** (0.111)	-18.61** (8.971)	0.79*** (0.163)	-1.51 (3.242)	-0.00 (0.160)
<i>Traditional Religion =1</i>	-11.42* (6.584)	0.22 (0.163)	-19.76** (9.080)	0.37 (0.225)	0.86 (5.302)	0.10 (0.248)
<i>Other Religion =1</i>	5.72 (7.411)	-0.43*** (0.155)	2.11 (8.445)	-0.34 (0.207)	5.29 (7.963)	-0.65*** (0.245)
<i>Private School</i>	5.54 (4.071)	0.04 (0.127)	8.89 (5.658)	-0.03 (0.180)	4.80 (3.198)	0.07 (0.185)
<i>Religious school</i>	5.27* (3.141)	-0.14 (0.085)	6.75 (4.158)	-0.17 (0.117)	3.75 (2.596)	-0.15 (0.131)
<i>Maths teacher absent</i>	3.62 (4.934)	-0.21* (0.119)	3.09 (6.036)	-0.18 (0.161)	-0.06 (4.433)	-0.23 (0.185)
<i>Urban = 1</i>	6.72* (3.525)	-0.06 (0.105)	9.11* (5.449)	-0.28* (0.146)	5.46* (2.879)	0.17 (0.154)
<i>North = 1</i>	19.88** (8.636)	-0.82*** (0.109)	20.15* (10.708)	-0.98*** (0.151)	10.15* (6.143)	-0.66*** (0.165)
<i>lambda</i>	-46.53** (19.959)		-45.85** (21.924)		-22.64 (17.615)	
<i>Constant</i>	70.91* (36.264)	-0.89 (0.584)	70.30 (43.090)	-0.69 (0.786)	37.58 (30.578)	-1.37 (0.907)
<i>Observations</i>	1,369	1,369	759	759	610	610

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

Table A5. 11: Determinants of Mathematics Scores (ZINB)

VARIABLES	All	ZINB Boys	Girls
<i>Girl child = 1</i>	-0.03 (0.022)		
<i>Child Age (years)</i>	0.05*** (0.006)	0.05*** (0.008)	0.04*** (0.010)
<i>Schooling for age (SAGE)</i>	0.24*** (0.041)	0.17*** (0.054)	0.33*** (0.062)
<i>Raven score</i>	0.03*** (0.004)	0.03*** (0.006)	0.04*** (0.007)
<i>Digit-Span test score</i>	0.02*** (0.004)	0.03*** (0.006)	0.02** (0.006)
<i>Total parental schooling (years)</i>	-0.00 (0.005)	-0.01 (0.007)	0.00 (0.008)
<i>Mother's Age (years)</i>	-0.00 (0.002)	-0.00* (0.003)	0.00 (0.003)
<i>Father's Age (years)</i>	-0.00 (0.002)	0.00 (0.002)	-0.01* (0.003)
<i>Educ hh head (years)</i>	0.00 (0.008)	0.01 (0.010)	-0.00 (0.012)
<i>Female hhh =1</i>	0.05 (0.091)	0.09 (0.114)	0.02 (0.152)
<i>HH size</i>	-0.00	0.00	-0.01
<i>Controls for hh consumption</i>	Yes (0.005)	Yes (0.006)	Yes (0.008)
<i>Muslim =1</i>	-0.06* (0.031)	-0.11*** (0.042)	0.00 (0.047)
<i>Traditional Religion =1</i>	-0.00 (0.053)	-0.12 (0.073)	0.13 (0.079)
<i>Other Religion =1</i>	-0.04 (0.049)	-0.05 (0.062)	-0.02 (0.078)
<i>Private School</i>	0.10*** (0.032)	0.14*** (0.044)	0.07 (0.046)
<i>Religious school</i>	0.04* (0.023)	0.06** (0.031)	0.03 (0.035)
<i>Maths teacher absent</i>	0.03 (0.036)	0.04 (0.046)	-0.01 (0.056)
<i>Urban = 1</i>	0.08*** (0.027)	0.05 (0.038)	0.10*** (0.040)
<i>North = 1</i>	0.08** (0.030)	0.09** (0.039)	0.06 (0.048)
<i>Constant</i>	3.19*** (0.102)	3.18*** (0.141)	3.21*** (0.145)

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

table continued on next page

Table A5.3 (continued): Determinants of Mathematics Scores (ZINB)

TABLE A1.5 (continued): Determinants of Mathematics Score (LHS)			
VARIABLES	All	ZINB	
		Boys	Girls
<i>Inflate</i>			
<i>Child Age (years)</i>	-0.26*** (0.046)	-0.33*** (0.063)	-0.17** (0.068)
<i>Schooling for age (SAGE)</i>	-0.80*** (0.263)	-1.14*** (0.363)	-0.47 (0.388)
<i>Raven score</i>	-0.06* (0.034)	-0.08 (0.047)	-0.06 (0.049)
<i>Total parental schooling (years)</i>	-0.08*** (0.020)	-0.08*** (0.028)	-0.07** (0.029)
<i>Urban = 1</i>	0.44** (0.214)	0.70** (0.299)	0.13 (0.310)
<i>North = 1</i>	0.74*** (0.191)	0.79*** (0.264)	0.66** (0.282)
<i>Constant</i>	2.07*** (0.555)	3.10*** (0.781)	0.98 (0.780)
<hr/>			
<i>Ln alpha constant</i>	-2.15*** (0.048)	-2.19*** (0.065)	-2.18*** (0.074)
<i>Observations</i>	1,369	759	610

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

Table A5. 12: Determinants of achievement in Mathematics (OLS)

VARIABLES	All	OLS	
		Boys	Girls
<i>Girl child = 1</i>	-1.35 (1.216)	-	-
<i>Child Age (years)</i>	2.88*** (0.337)	3.25*** (0.451)	2.25*** (0.521)
<i>Schooling for age (SAGE)</i>	15.79*** (2.251)	12.06*** (3.068)	21.11*** (3.355)
<i>Raven score</i>	2.04*** (0.252)	1.66*** (0.349)	2.42*** (0.371)
<i>Digit-Span test score</i>	1.57*** (0.244)	1.88*** (0.345)	1.41*** (0.350)
<i>Total parental schooling (years)</i>	-0.15 (0.285)	-0.55 (0.399)	0.23 (0.415)
<i>Mother's Age (years)</i>	-0.21* (0.123)	-0.41** (0.166)	0.04 (0.185)
<i>Father's Age (years)</i>	0.07 (0.099)	0.23* (0.133)	-0.13 (0.148)
<i>Muslim =1</i>	-3.70** (1.739)	-6.32*** (2.418)	-1.56 (2.532)
<i>Traditional Religion =1</i>	-5.75** (2.836)	-12.12*** (3.938)	2.81 (4.196)
<i>Other Religion =1</i>	-2.29 (2.692)	-2.96 (3.504)	-0.42 (4.278)
<i>Private School</i>	5.73*** (1.830)	8.00*** (2.600)	4.07 (2.563)
<i>Religious school</i>	2.49* (1.297)	3.92** (1.767)	1.79 (1.932)
<i>Maths teacher absent</i>	0.61 (1.973)	1.71 (2.593)	-2.23 (3.045)
<i>Urban = 1</i>	5.55*** (1.545)	4.37** (2.166)	6.53*** (2.206)
<i>North = 1</i>	3.67** (1.697)	3.50 (2.266)	3.34 (2.576)
<i>Household controls</i>	Yes	Yes	Yes
<i>Constant</i>	-2.82 (5.584)	-4.79 (7.873)	2.41 (7.881)
<i>Observations</i>	1,214	674	540
<i>R-squared</i>	0.348	0.318	0.423

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

Table A5. 13: Determinants of English Scores (2-step Heckman)

VARIABLES	<i>All</i>		<i>Boys</i>		<i>Girls</i>	
	(1)	(2)	(1)	(2)	(1)	(2)
<i>Girl child = 1</i>	3.40 (2.447)	-0.04 (0.079)		-		-
<i>Child Age (years)</i>	1.38 (1.025)	0.00 (0.047)	2.16* (1.204)	-0.05 (0.062)	1.41 (1.406)	0.08 (0.076)
<i>Schooling for age</i>	10.11 (7.193)	-0.13 (0.362)	2.39 (11.004)	-0.22 (0.497)	21.81*** (6.006)	-0.08 (0.565)
<i>Years of schooling child</i>		0.17** (0.070)		0.25*** (0.096)		0.08 (0.109)
<i>Raven score</i>	1.96*** (0.499)	-0.00 (0.017)	1.68** (0.708)	0.01 (0.023)	2.24*** (0.576)	-0.03 (0.026)
<i>Digit-Span test score</i>	1.64*** (0.591)	0.05*** (0.017)	1.58* (0.811)	0.05** (0.023)	1.91*** (0.661)	0.05* (0.025)
<i>Parents total years of schooling</i>	0.66 (0.572)	0.00 (0.020)	0.48 (0.816)	0.02 (0.028)	0.61 (0.642)	-0.01 (0.030)
<i>Mother's Age (years)</i>	-0.18 (0.246)	0.00 (0.007)	-0.44 (0.336)	-0.00 (0.010)	0.16 (0.296)	0.01 (0.011)
<i>Father's Age (years)</i>	-0.22 (0.198)	-0.00 (0.006)	-0.15 (0.271)	0.00 (0.008)	-0.32 (0.236)	-0.01 (0.008)
<i>Educ hhh (yrs)</i>	-0.44 (0.932)	0.03 (0.030)	0.03 (1.261)	0.03 (0.042)	-0.59 (1.069)	0.03 (0.046)
<i>Female hhh =1</i>	-20.41** (10.255)	0.32 (0.429)	-25.38* (14.148)	0.62 (0.562)	-16.62 (12.352)	-0.23 (0.659)
<i>HH Consumption Quintile = 2</i>	-7.47 (4.620)	0.25** (0.117)	-1.66 (5.512)	0.07 (0.161)	-11.19* (6.600)	0.41** (0.177)
<i>HH Consumption Quintile = 3</i>	-11.75* (6.307)	0.57*** (0.124)	-7.15 (6.608)	0.36** (0.171)	-12.24 (9.297)	0.79*** (0.187)
<i>HH Consumption Quintile = 4</i>	-6.27 (5.617)	0.44*** (0.125)	0.53 (6.342)	0.29* (0.171)	-10.55 (7.605)	0.53*** (0.192)
<i>HH Consumption Quintile = 5</i>	-6.06 (5.597)	0.43*** (0.129)	-4.43 (6.420)	0.24 (0.177)	-5.18 (8.380)	0.65*** (0.198)
<i>HH size</i>	-1.15 (0.777)	0.07*** (0.017)	-1.26 (0.996)	0.07*** (0.024)	-0.68 (0.853)	0.05** (0.025)
<i>Muslim =1</i>	-4.35 (4.733)	0.41*** (0.111)	-11.35 (8.044)	0.79*** (0.163)	4.73 (3.952)	-0.00 (0.160)
<i>Traditional Religion =1</i>	-4.86 (5.766)	0.22 (0.163)	-3.17 (8.197)	0.37 (0.225)	-2.86 (6.502)	0.11 (0.248)
<i>Other Religion =1</i>	12.20* (6.495)	-0.43*** (0.155)	10.60 (7.620)	-0.34 (0.207)	9.36 (9.933)	-0.65*** (0.246)
<i>Private School</i>	8.70** (3.563)	0.03 (0.127)	9.15* (5.109)	-0.03 (0.180)	10.23*** (3.853)	0.06 (0.185)
<i>Religious school</i>	3.81 (2.739)	-0.13 (0.085)	3.43 (3.750)	-0.17 (0.117)	4.63 (3.115)	-0.14 (0.131)
<i>Eng teacher absent</i>	5.99 (4.538)	-0.24** (0.120)	5.82 (5.507)	-0.18 (0.161)	2.12 (6.067)	-0.29 (0.189)
<i>Urban = 1</i>	9.49*** (3.075)	-0.06 (0.105)	12.93*** (4.885)	-0.28* (0.146)	7.26** (3.508)	0.17 (0.154)
<i>North = 1</i>	10.48 (7.519)	-0.83*** (0.109)	14.42 (9.621)	-0.98*** (0.151)	-0.75 (7.525)	-0.66*** (0.165)
<i>lambda</i>	-40.75** (17.336)		-41.40** (19.651)		-23.73 (21.844)	
<i>Constant</i>	43.70 (31.294)	-0.88 (0.584)	44.47 (38.526)	-0.67 (0.787)	20.70 (37.307)	-1.37 (0.907)
<i>Observations</i>	1,369	1,369	759	759	610	610

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

Table A5. 14: Determinants of English Scores (ZINB)

VARIABLES	All	ZINB	
		Boys	Girls
<i>Girl child = 1</i>	0.05 (0.030)		
<i>Child Age (years)</i>	0.04*** (0.008)	0.04*** (0.011)	0.05*** (0.012)
<i>Schooling for age (SAGE)</i>	0.38*** (0.059)	0.27*** (0.083)	0.50*** (0.084)
<i>Raven score</i>	0.05*** (0.006)	0.05*** (0.008)	0.04*** (0.008)
<i>Total parental schooling (years)</i>	0.00 (0.007)	0.00 (0.009)	0.00 (0.010)
<i>Mother's Age (years)</i>	-0.00 (0.003)	-0.00 (0.004)	-0.00 (0.005)
<i>Father's Age (years)</i>	0.00 (0.003)	0.00 (0.003)	0.00 (0.004)
<i>Educ hh head (years)</i>	0.01 (0.011)	0.02 (0.015)	0.00 (0.017)
<i>Female hhh =1</i>	-0.16 (0.124)	-0.15 (0.177)	-0.22 (0.175)
<i>HH size</i>	-0.00 (0.008)	0.00 (0.010)	-0.02 (0.011)
<i>Control for hh consumption</i>	Yes	Yes	Yes
<i>Muslim =1</i>	-0.07* (0.045)	-0.09 (0.062)	-0.04 (0.065)
<i>Traditional Religion =1</i>	-0.20** (0.081)	-0.06 (0.113)	-0.30** (0.118)
<i>Other Religion =1</i>	0.08 (0.068)	0.14 (0.089)	-0.03 (0.108)
<i>Private School</i>	0.10** (0.041)	0.12** (0.059)	0.09 (0.057)
<i>Religious school</i>	0.03 (0.032)	0.05 (0.044)	0.02 (0.046)
<i>Eng. teacher absent</i>	0.11** (0.053)	0.10 (0.069)	0.08 (0.083)
<i>Urban = 1</i>	0.09*** (0.036)	0.09* (0.050)	0.11** (0.052)
<i>North = 1</i>	0.09* (0.045)	0.12* (0.061)	0.06 (0.067)
<i>Constant</i>	2.98*** (0.149)	2.94*** (0.210)	3.15*** (0.209)

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

table continued on next page

TableA5.6 (continued): Determinants of English Scores (ZINB)

VARIABLES	All	ZINB	
		Boys	Girls
Inflate			
Child Age (years)	-0.24*** (0.033)	-0.26*** (0.045)	-0.22*** (0.050)
Schooling for age (SAGE)	-1.58*** (0.210)	-2.10*** (0.296)	-1.05*** (0.304)
Raven score	-0.02 (0.025)	-0.02 (0.034)	-0.03 (0.037)
Total parental schooling (years)	-0.03** (0.014)	-0.04** (0.019)	-0.02 (0.020)
Urban = 1	-0.37** (0.154)	-0.24 (0.215)	-0.53** (0.221)
North = 1	0.94*** (0.145)	0.82*** (0.197)	1.06*** (0.217)
Constant	3.40*** (0.420)	4.06*** (0.594)	2.91*** (0.593)
Constant	-1.79*** (0.053)	-1.75*** (0.072)	-1.89*** (0.081)
Observations	1,369	759	610

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

Table A5. 15: Determinants of achievement in English (OLS)

VARIABLES	OLS 2		
	All	Boys	Girls
<i>Girl child = 1</i>	2.66 (1.685)	-	-
<i>Child Age (years)</i>	3.20*** (0.466)	3.84*** (0.615)	2.66*** (0.738)
<i>Schooling for age (SAGE)</i>	23.17*** (3.225)	21.17*** (4.391)	25.19*** (4.888)
<i>Raven score</i>	2.00*** (0.342)	1.93*** (0.472)	2.07*** (0.510)
<i>Digit-Span test score</i>	2.44*** (0.323)	2.47*** (0.458)	2.34*** (0.478)
<i>Total parental schooling (years)</i>	0.66* (0.389)	0.72 (0.539)	0.49 (0.586)
<i>Mother's Age (years)</i>	-0.16 (0.177)	-0.47** (0.237)	0.23 (0.278)
<i>Muslim =1</i>	2.78 (2.482)	1.25 (3.420)	4.68 (3.739)
<i>Traditional Religion =1</i>	-2.12 (4.100)	0.80 (5.686)	-2.10 (6.200)
<i>Other Religion =1</i>	3.99 (3.945)	4.58 (4.968)	1.69 (6.734)
<i>Private School</i>	9.11*** (2.406)	7.74** (3.370)	10.90*** (3.491)
<i>Religious school</i>	1.79 (1.793)	1.07 (2.441)	3.53 (2.726)
<i>Eng teacher absent</i>	1.40 (2.887)	2.37 (3.629)	-1.62 (4.760)
<i>Urban = 1</i>	8.13*** (2.053)	8.13*** (2.870)	8.60*** (3.028)
<i>North = 1</i>	-4.81** (2.430)	-2.60 (3.264)	-7.57** (3.727)
<i>Household controls</i>	Yes	Yes	Yes
<i>Constant</i>	-23.97*** (7.957)	-27.65** (11.192)	-17.21 (11.495)
<i>Observations</i>	986	548	438
<i>R-squared</i>	0.428	0.410	0.471

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

