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WOMEN'S EMPOWERMENT AND ECONOMIC DEVELOPMENT: MACRO AND MICRO EVIDENCE FROM AFRICA

BY

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DECLARATION

I, Daniel Osarfo, hereby declare that this thesis, except for references to other literature which have been acknowledged, is the result of my own effort, produced from research undertaken under supervision, and that it has neither in whole or in part been presented elsewhere for the award of a degree.

23th January, 2023

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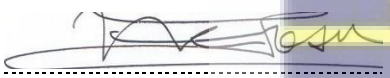
This thesis has been carried out and submitted with my approval as a supervisor:



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ABSTRACT

The concept of women's empowerment is very broad, context-specific and multidimensional. However, a substantial portion of the economics literature that examines the welfare effects of women's empowerment has focussed on improving women's access to resources. Social institutions are very crucial in determining the agency and bargaining power of women in many regions of the world. In Africa, for instance, the social dimension of female empowerment has received relatively less attention despite its influence on the agency of women. Also, the lack of appropriate micro-level measures for the political empowerment of women has nearly led to the neglect of that dimension. This study constitutes a comprehensive attempt to examine the various dimensions of women's empowerment and the effect on levels of welfare.

Specifically, the study investigates (i) the effect of women's political empowerment on the income and non-income measures of welfare in Africa, (ii) the effects of women's empowerment on the cognitive development and academic achievement of children in Ghana as well as (iii) the influence of women's empowerment on the health or nutrition of children in Ghana. The thesis employs suitable standard approaches such as the two-stage least-squares fixed-effect estimation, the panel Tobit estimation and quantile regression to examine the linkages.

The following are the key findings: First, political empowerment of women has a significant positive effect on the non-income measure of welfare. In contrast, the effect on household income is marginal. This finding supports the vast literature that suggests that women are more inclined to opt for or support policies that enhance the health and education of children when in a position of power. Second, there is evidence that women's economic empowerment and women's social empowerment improve the learning outcomes of their wards. Finally, the thesis shows that women's empowerment via either improved access to

resources or social norms that enhance women's bargaining power and agency improves their children's health. The critical elements of women's empowerment that drive this effect are a woman's employment status, land ownership, savings, decision-making participation and unrestricted family contact.

The thesis makes valuable contributions to knowledge. Empirically, it provides evidence of how different forms of women's empowerment influence welfare. It also presents new evidence on the effects of political empowerment on welfare in Africa. This thesis also brought to bear the indirect effect of the various forms of empowerment on the quality of learning. The study focuses on undernutrition and over nutrition, allowing for different impacts on children with varying nutritional statuses. Methodology-wise, this thesis uses improved measures of political empowerment of women, contrary to using the share of women in parliament as has been widely employed in the existing literature. Also, contrary to most existing studies in Ghana, this study benefits from using the GSEPS data to assess how women's empowerment affects their wards' quality of learning, benefiting from a more comprehensive array of covariates. As much as practicable, the study aims at providing causal inference, contrary to other existing studies that assessed simple correlations.

Based on the findings of the thesis, some key recommendations are suggested for practice and policy. Governments, civil society organisations and other non-governmental organisations must strengthen capacity-building efforts such as education and training to improve the confidence and competence of women. This would make women fit to occupy positions of power in society and arm them with the requisite skills to compete in the job market. Governments must also strengthen the legal frameworks that secure and protect women's rights and use affirmative action policies or quotas to get women involved, where necessary and but at the expense of competence and capability. Lastly, the key elements of women's empowerment, namely, employment, savings and land ownership, call for support

from partners and governments alike. Traditional stipulates that prevent women from owning land and hamper their engagement in gainful employment must be changed. Also, the Intestate Succession Law must be upheld in guaranteeing the right of inheritance for a surviving spouse, children, the customary family and parents and ensuring that a greater portion of the property is shared among the surviving spouse and children.

Ultimately, the study recommends conscious social education on the welfare gains that may accrue from modifying some of the restrictive social norms that hinder women's agency. Social empowerment may complement the positive effect of women's economic empowerment in welfare enhancement. Women must be included in family decision-making processes and encouraged to maintain meaningful social networks due to their pro-welfare effects.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Economic development has been recognised as the ultimate target or end of human activity and can also be seen as the expected end product of economic growth (UNDP, 2006). Economic growth has a mutually reinforcing relationship with economic development, wherein one instance, economic growth makes available the resources to foster sustained improvements in development. Also, development leads to the betterment of the quality of the labour force. This boosts their contribution to economic growth. There is, thus, a robust bi-directional linkage between economic growth and development (Ranis, Stewart & Ramirez, 2000). Economic growth is expected to translate into economic development and enhance the welfare levels enjoyed by a population. Some studies have noted a positive relationship between development outcomes and economic growth (Deininger & Squire, 1996; Ranis et al., 2000). Other studies found the distribution of income to be a significant mediating factor in the welfare-enhancing effect of economic growth (Fosu, 2010a, 2010b, 2015; Ravallion, 1995). Moreover, government spending positively affects welfare outcomes (Filmer & Pritchett, 1999; Haile & Niño-Zarazúa, 2018), whereas corruption affects welfare adversely (Rajkumar & Swaroop, 2008).

Economic development has been defined as a welfare-enhancing mechanism and is supported by a clarification provided by Todaro & Smith (2003). They describe development as a multidimensional process that involves significant changes in popular attitudes, social structures and national institutions, as well as the quickening of economic growth, inequality reduction, and the complete removal of absolute poverty. Economic development, therefore, implies increased levels of welfare. To narrow down the definition, proxies such as income or expenditure levels, health and education status of the people in a country have been

employed. However, this leads to a very reductionist interpretation. Some indicators from the United Nations Development Programme (UNDP) such as the human development index (HDI), inequality-adjusted human development index (IHDI), education index, mortality rates (for infants and children under age 5), life expectancy and income index, have been used as measures of welfare.

Sub-Saharan Africa (SSA) recorded an HDI (IHDI) index of 0.537 (0.372), which is far below the averages for developing countries (0.681 (0.531)) (UNDP, 2018). According to data from the WDI (2020) database, Sub-Saharan African countries have the worst rates of infant mortality (52 deaths per 1000 live births) and under-five mortality (76 deaths per 1000 live births) in 2019. The SSA situation is much worse than the developing countries' average infant mortality (47 deaths per 1000 live births) and under-five mortality (66 deaths per 1000 live births), as well as the world average infant mortality of 29 deaths per 1000 live births and under-five mortality of 39 deaths per 1000 live births. Despite their crucial role in societal and national development, the situation is direr for women as being responsible for childcare provision (Friedemann-Sánchez, 2006). Globally, women's access to welfare inputs such as health, education, and capital, among others, is hugely constrained (FAO, 2011; World Bank & International Monetary Fund, 2007). For instance, according to data from the World Development Indicators (WDI) (2019), only about 47% of women are able to participate in the labour force (compared to the 74% labour force participation rate for males). Within the same period, 26% held seats in their national parliaments (WDI, 2021).

A look at women in SSA paints a more dire picture as women in SSA have the lowest percentage of women employed in paid non-agricultural economic activities (United Nations, 2011). Women in the region lag behind men in terms of illiteracy rates as only 58% are literate (compared to 71% for men). In addition, women in the region lag behind men as their labour force participation rate in 2019 was 61% compared to 73% for men. Women in SSA

have recorded a high number of adverse health status outcomes compared to other regions, and the negative implications for children's health cannot be disregarded. SSA has the highest adult lifetime maternal death risk (1 in 38) in the world. Besides, interventions that have been formulated to reduce maternal mortality (including the use of modern contraceptives, antenatal visits and skilled birth attendance) are less patronised in SSA than in any other region (World Bank, 2021). The existing gender-based inequities affect the rate at which countries develop. Such inequalities fuel the skewed nature of resource allocation in favour of male-dominated activities and gender gaps in (primary, secondary and tertiary) education. Also, the high number of hours dedicated to housework may constrain the time left to engage in gainful economic activities. Gender-based inequality also implies reduced work opportunities. In addition to how gender-based inequalities affect productivity and development, they also limit the bargaining power wielded by women with implication for how household resources are allocated to cater to household members' health and education (Blackden, Canagarajah, Klasen & Lawson, 2007).

Recent literature has noted the role of women's empowerment in improving living standards and welfare levels in general. Diverse forms of economic empowerment (proxied by indicators such as the percentage of employed females, percentage of employers who are females and the Women's Economic Rights Index) are also noted to reduce child mortality rates (Forsythe, Korzeniewicz & Durrant, 2000; Patel, Rahman, Jacob & Hughes, 2004) and raise school enrolment rates (Bruce *et al.*, 1995; Luz & Agadjanian, 2015). Empowering women has attracted much focus in research and policy as existing studies have revealed that engaging women as equal participants in the community and the economy enhances development outcomes (Klugman, Hanmer, Twigg, Hasan, McCleary-Sills & Santamaria, 2014; Wong, 2012). Attempts to remove gender-based inequalities have led to many interventions being implemented to improve women's bargaining power with the hope to

enhance their capacity to reflect their preferences on the way household resources are allocated (Lundberg, Pollak & Wales, 1997; G. Sen & Batliwala, 2000).

The concept of empowerment is very expansive and complex. Broad classifications of empowerment entail political empowerment, economic empowerment, social empowerment and psychological empowerment (Malhotra, Schuler & Boender, 2002). Political empowerment describes the process of increasing the capacity of women to enable them to exercise control over community or national resources and contribute to societal decision making (Sundström, Paxton, Wang & Lindberg, 2017). Political empowerment includes providing women with the voice and agency, and advocacy needed by women to develop. Similarly, women's economic empowerment describes various media that enable women to exercise greater control over their life choices and resources and, thus, think ahead of their immediate daily survival (Zereyesus, Amanor-Boadu, Ross & Shanoyan, 2017). Thus, women's political empowerment could play a complementary role in women's economic empowerment to enhance the livelihoods of women and children (and could trickle down to the whole population). Women's social empowerment is the enhancement of a sense of self-confidence, building and changing social relationships, institutions and discourses that exclude women from attaining improved welfare (Combaz & Mcloughlin, 2014).

Africa ranks low in both welfare outcomes and the level of women's political empowerment. Compared to European and American countries, African countries have a smaller proportion of women in their parliaments (World Bank, 2018). The literature has identified one main channel through which the political empowerment of women affects the level of welfare of people in a country. Women and men have different preferences that propel them to make different choices when they assume essential political responsibilities (Burchi & Singh, 2020; Chattopadhyay & Duflo, 2004). Boehmer & Williamson (1996) argued that when women attain higher status or increased political representation, they can significantly influence

social policy. This results in increased investment in education, healthcare, nutrition and other social interventions that enhance welfare (Boehmer & Williamson, 1996; Koenen, Lincoln & Appleton, 2006). However, the literature on how the political empowerment of women affects welfare levels has found inconclusive results. While some studies have noted immense welfare benefits from the political empowerment of women (Bhalotra & Clots-Figueras, 2014; Burchi & Singh, 2020; Homan, 2017; Quamruzzaman & Lange, 2016), others found inconclusive results. Clots-figueras (2012) found a positive effect on school enrolment for only rural areas, while Boehmer & Williamson (1996) found a slight negative association between women's political empowerment and infant mortality. Wängnerud & Sundell (2012) found no effect on health, employment rates and poverty reduction. The inconclusive literature calls for more empirical investigation into the relationship between women's political empowerment and welfare outcomes in Africa.

Another issue in the literature is that the HDI, which is a very widely used measure of welfare in the existing literature, has been criticised as not being intertemporally comparable (Morris, 1993) and that it measures relative improvement in welfare, such that the index can change without actual improvements in the variables used in its computation (McGillivray, 1991). Also, the proportion of women in parliament as a measure of political empowerment has dominated the literature. However, it does not inculcate many aspects of political empowerment such as agency, rights and civil society participation. This study focuses on Africa and estimates a causal relationship between the political empowerment of women (measured by the new Women's Political Empowerment Index) and the levels of welfare for African countries. Welfare is measured by household income (the income component) and a newly created non-income measure of welfare (the HD) which follows the UNDP's HDI method but can be compared intertemporally.

Like many other countries in Africa, Ghana faces significant challenges in cognitive abilities and schooling achievement, particularly recording low proficiency in mathematics and English (MOE/GES/NEAU, 2016). According to the Ghana National Education Assessment (NEA), the proficiency rates (e.g., percentage of pupils answering at least 55 percent of the questions correctly) achieved by pupils in rural areas were even worse, ranging from 14 percent for Primary 4 (P4) mathematics to 30 percent for Primary 6 (P6) English. The problem is also direr for children in public schools as less than 35 percent attained proficiency rates across subjects. Despite the welfare-enhancing nature of women's empowerment, existing studies linking women's empowerment and the cognitive development and academic achievement of students in developing economies are limited. While some studies around the world have found a positive relationship between the empowerment of women and children's mental development (Lavy, Lotti & Tan, 2016; Rubio-Codina, Attanasio & Grantham-McGregor, 2016; Graham-Bermann, Howell, Miller, Kewk & Lilly, 2010; Jouriles, Brown, McDonald, Rosenfield, Leahy& Silver, 2008), others found no effect (Peek-Asa, Maxwell, Stromquist, Whitten, Limbos & Merchant, 2007). Also, most of such studies have been conducted outside the African context. This study is a novel attempt to examine the relationship between the empowerment status of a mother and the cognitive development and academic achievement of her children in Ghana. The study examines how women's empowerment affects children's cognitive development and academic performance.

Another challenge in developing countries such as Ghana is the endemic nature of malnutrition (encompassing both undernutrition and over nutrition). Malnutrition occurs when individuals consume insufficiently balanced meals, wherein many vital nutrients that are required (i.e., protein, mineral salts, carbohydrate, water, vitamins, fat and oil) are either in the wrong proportion, absent or in excess (Doak, Adair, Bentley, Monteiro & Popkin,

2005). Malnutrition threatens the future economic productivity of individuals by impeding their human capital development at the early stages of life (Pelletier & Frongillo, 2003; Pelletier, Frongillo & Habicht, 1993). Most existing studies have found a positive relationship between the empowerment of women (especially maternal education) and children's health (Bourdier, 2019; Currie & Moretti, 2003; Ibrahim, Tripathi & Kumar, 2015; Imai, Annim, Kulkarni & Gaiha, 2014; Singh, Haney & Olorunsaiye, 2013). Studies examining the relationship between maternal empowerment and child nutritional outcomes in Ghana have mostly assumed that the effect is even for undernourished, normal and over-nourished children (Amugsi, Lartey, Kimani & Mberu, 2016; Bourdier, 2019; Zereyesus *et al*., 2017). Inferences from such analyses do not reflect the reality, and as such, the findings could proffer inaccurate implications for policy. Also, the DHS data has been the primary source of data for such analysis. This study uses the quantile regression estimation approach and the Ghana Socioeconomic Panel Survey (GSEPS) data, thus, accounting for differential effects and different points on the conditional distribution of child nutrition and benefiting from using a more comprehensive array of covariates.

1.2 Problem Statement

The problem statement discussed in this section of the thesis is presented in three themes, following some noted gaps in the literature. Existing studies have failed to (i) examine the effect of women's political empowerment on welfare (measured by household income and a measure of human development) in Africa, (ii) examine how different forms of women's empowerment affect the cognitive development and academic achievement of their children and (iii) extensively examine how the empowerment of women affects the nutritional statuses of under-five children, taking into consideration the differences in their nutritional statuses.

1.2.1 Political empowerment and welfare

Whether and how improvement in female political status enhances development remains a subject of debate. A small body of work has delved into the realms of health, education and household expenditure or income. Some studies have found positive effects (Burchi & Singh, 2020; Homan, 2017; Kanter, 1977; Quamruzzaman & Lange, 2016), whilst others have had more inconclusive findings (Bhalotra & Clots-Figueras, 2014; Boehmer & Williamson, 1996; Wängnerud & Sundell, 2012). Also, few existing studies have shown that the percentage of women in parliament is positively related to economic growth (Jayasuriya & Burke, 2013; Xu, 2015), peace (O'Keefe, 2017) and health (Macmillan, Shofia & Sigle, 2018).

Studies in the contemporary era primarily focus on enhancements in women's political representation proxied by the share of female legislators (Fallon, Swiss & Viterna, 2012; Kenworthy & Malami, 1999; Paxton, 1997). A disadvantage, notwithstanding, of using the percentage of women in parliament as an indicator for political empowerment of women is that it does not capture the whole essence of political empowerment of women; it ignores the rights of women, agency and civil society participation which are all essential for women to actively take part in governance. Moreover, the HDI, which is the most widely used measure of aggregate welfare, has been widely criticised. A key criticism is that it measures relative improvements in welfare and not actual improvements. According to McGillivray (1991), a country's rank can change without any change in the variables used in its computation. Also, Morris (1993) noted that the HDI does not have a fixed reference point and that the time series generated may not be comparable across time and may lead to inaccurate policy directions.

It is also unclear whether the political empowerment of women affects the income and non-income components of welfare equally. In addition, a question that begs to answer is whether to focus on women's empowerment ahead of other conventional welfare policies. The inadequacy of existing measures of women's political empowerment, the difficulty in

intertemporally comparing the HDI as a measure of welfare and the possibly diverse effect of women's empowerment on income and non-income components of welfare have been noted. These broad lacunae necessitate further enquiry.

1.2.2 Maternal empowerment, cognitive development and academic performance of children in Ghana

Although many studies have examined child outcomes and how they are affected by women's empowerment (Ahun, Aboud, Aryeetey, Colecraft & Marquis, 2017; Amugsi *et al*., 2016; Bhagowalia, Menon, Quisumbing & Soundararajan, 2010; Pratley, 2016), very few have examined the effect on school enrolment and achievements (Luz & Agadjanian, 2015). Cognitive development is established as a predictor of higher educational attainment, productivity and economic growth. However, it has received little attention in Ghana and Africa in General (Ghana Statistical Service, 2011). Also, research on the relationship between mothers' empowerment and their wards' cognitive development has mainly employed mothers' level of education as a proxy for empowerment (Lavy *et al*., 2016). The focus has been on how earnings, boosted by high education, can be made available and invested in inputs of child development such as books, good nutrition and good healthcare (Kiernan and Huerta, 2008; Carneiro, Meghir & Parey, 2013). Thus, the analysis of how women's empowerment affects the quality of learning has not received much attention in the existing literature. Indeed, a very similar assessment of the association between women's empowerment and child cognitive development was conducted by Lavy *et al*. (2016) in an experimental study of the effect of a programme or intervention that targeted both women's empowerment and child development. Hence, considering the considerable learning deficit and the strong evidence that children in Ghana perform below par (MOE/GES/NEAU, 2016), there is a need to examine the factors that improve cognitive development and schooling achievement.

Also, many studies that assessed the cognitive development of children focused on early childhood (Brooks-Gunn and Duncan, 1997; Walker, Chang, Powell & Grantham-McGregor, 2005; Berardi, Parasuraman & James, 2010; Schady, 2011) and preschool-aged children (Ruhm, 2000). Without discounting the effect previously documented, this research expands the analysis to all children[1] from pre-school to adulthood, given that mothers continue to relate with their wards even as they exit childhood and enter into other stages of life (adolescent years and early adulthood). It has been shown that cognitive development occurs in adulthood and is noted to be complex, rich and dynamic, perhaps even more so compared to infancy and childhood. For instance, adults often show regression performances (i.e., adults may experience reduced cognitive skill levels) or move up to higher levels rather than following a simple forward progression (Fischer, Yan & Stewart, 2012; Lövdén, Fratiglioni, Glymour, Lindenberger & Tucker-Drob, 2020). However, the literature has primarily ignored cognitive development in adulthood. The study leverages the richness of the GSEPS data, which contains cognitive tests (5 to 15 years of age) and academic tests (9 to 26 years of age). Another major contribution is the use of nationally representative panel data in this investigation. Most previous studies, especially in Africa, have used the cross-sectional Demographic and Health Survey (DHS) data. This study uses different nationally representative data, which enjoys the added advantage due to its panel structure.

Furthermore, the correlation between the empowerment of women and their wards' cognitive development could be driven by other factors that influence both higher empowerment and child development. For instance, areas with higher access to education and better institutions that deter the perpetration of violence against women may also have better educational infrastructure and may attract quality teachers and influence the quality of learning. This may

[1] In examining the effect of women's empowerment on the cognitive development and academic achievement, the word children is used interchangeably with wards. It means progeny or offspring and not minors

lead to spurious estimations, making results from such estimations inaccurate and inconsistent.

1.2.3 Women's empowerment and under-five nutrition in Ghana

Concerning under-five malnutrition in Ghana, this study investigates the effect of a mother's economic empowerment on child's nutritional outcomes. Over the years, Ghana has recorded some high cases compared to other developing countries concerning the prevalence of wasting, underweight and stunting among children. Most African countries, including Ghana, suffer from malnutrition, evidenced by the high malnutrition rates eminent in these nations. Despite the numerous government initiatives that have been instituted to reduce child malnutrition, the problem persists and requires more coordinated effort and research into the more nuanced causes and solutions. According to UNICEF, Ghana (2016), 23 percent of children are still stunted, and 57 percent are anaemic. The 2014 Ghana Demographic Health Survey (GDHS) approximates that 20 percent of all children under five years in Ghana are chronically malnourished or stunted. Malnutrition is particularly severe in the Northern region, where four out of every ten children are stunted, and more than 80 percent of these children are anaemic (Ngongi, 2013) and lowest in Greater Accra region with about 10 percent prevalence rate. A higher prevalence is recorded among children whose mothers have limited education (26 percent). Acute malnutrition or wasting has 5 percent prevalence, while about 11 percent of children below age 5 are underweight. According to the World Development Indicators (WDI), recent evidence has revealed that Ghana recorded 12.6 percent underweight, 6.8 percent wasting, and 17.5 percent stunting among all children under 5 years in 2017 (World Bank, 2018).

Most existing studies have focused on the severity, causes and effects of malnutrition (Ngongi, 2013; Imai *et al.*, 2014). Other related studies have looked at how a mother's education and control of household financial resources affect child nutrition (Jayawardena,

2014; Imai *et al*., 2014). Besides, the implicit assumption in most of the existing studies is that the effect of empowerment on child nutrition status is even across various points on the conditional distribution of the measure of child nutrition status (Z-scores). However, behaviours that affect child nutrition may differ along the different points in the conditional distribution of child health. In other words, factors that affect an over-nourished child may affect an undernourished child differently and vice versa. Existing studies that have estimated the effect of the empowerment of women on the health status of children at varying points in conditional distribution mainly applied arbitral quantile values such as percentages. This may lead to wrong conclusions as those arbitral values may not truly reflect the nutritional group or status of the child (Rodgers & Kassens, 2018).

1.3 Research Questions

Research questions to be examined include:

i. What is the effect of women's political empowerment on welfare (proxied by household income and a non-income welfare index) among African countries?
ii. To what extent do the economic and social empowerment of women affect the cognitive development and academic performance of their wards[2] in Ghana?
iii. What is the effect of women's economic and social empowerment on children's nutritional status[3] in Ghana?

1.4 Research Objectives

The overarching objective of this thesis is to examine the relationship between women's empowerment and economic development (welfare) using macro and micro evidence from Africa.

[2] For the second objective, wards is used interchangeably with children (as in offspring or progeny). As such, the sample that is analysed contains young adults and is not restricted to minors.
[3] Nutritional status of children and health status of children are used interchangeably.

Specifically, this thesis seeks:

i. To examine the effect of women's political empowerment on welfare among African Countries.

ii. To examine the effect of women's economic and social empowerment on wards' cognitive development and academic achievement in Ghana.

iii. To examine the effect of women's economic and social empowerment on children's nutritional status in Ghana.

1.5 Justification and Significance of the Study

The multidimensionality of the concept of women's empowerment warrants a deeper look into how the various aspects of empowerment affect welfare. This study constitutes a comprehensive contribution to the growing literature on the dimensions of women's empowerment and how they affect welfare levels. To begin with, the study is among the few cross-national efforts to examine how women's political empowerment influences welfare among developing countries and a novel focus on Africa[4]. This thesis also seeks to contribute to the discussion on the extent to which women's empowerment, at the micro-level, may affect the welfare (usually proxied by health and educational outcomes) of individuals and make meaningful suggestions for policies that will improve welfare levels. The study also fits into the SDG goals and provides evidence that gains from women's empowerment are beneficial for women and enhance welfare levels in general. Following the objectives, this section discusses the various technical considerations and policy relevance that may accrue to answering each research question.

In examining the effect of the political empowerment of women on welfare in Africa, the study adopts appropriate methods to address issues such as the possible reverse causality

[4] The most recent research that is closest to this present study is Macmillan et al. (2018), which examined the effect of the proportion of women in parliament on child and maternal mortality.

between women's political empowerment and welfare using an instrumental variable approach. Other possible problems include a high correlation between political empowerment and economic growth. The literature also gives evidence of a possible reverse causality between the growth rate of GDP and the welfare statuses of individuals, leading to potential endogeneity (Ranis *et al*., 2000). As such, the predicted values of economic growth are used. The relationship between the political empowerment of women and welfare is also tested in a dynamic framework using the Generalised Method of Moments (GMM) estimation technique. Therefore, the results from this research will provide policy suggestions as to the need to factor gender spending in national budgets, given its effect on aggregate welfare. Also, it is important to note that the study adds a voice to the discussion on the extent to which women's empowerment should be given priority in the policy space. By ranking the various independent variables as per their share in the total variation in the measures of welfare, this study gives a clear picture of what welfare determinants demand priority. The study also justifies the various attempts to get women into leadership positions while also giving due attention to policy measures such as measures to enhance economic growth, improved sanitation and access to improved sources of water.

Besides, this study gives recommendations for public policy on improving the quality of learning of wards in Ghana. Given how poorly the children in Ghana have performed in test scores, this study is a novel attempt at examining the non-conventional factors that affect learning, such as diverse forms of women's empowerment. The use of the GSEPS data allows the study to control for many covariates and utilise the panel properties of the data. The existing literature has mainly tackled how maternal empowerment status affects the cognitive development of children under 24 months and has largely ignored possible selectivity bias

and unobserved heterogeneity[5]. By addressing these technical challenges, this study provides precise estimates of how the various dimensions of women's empowerment affect the quality of learning of wards in Ghana and make recommendations on how to empower women. Policy suggestions emanating from this study will go a long way to improve wards' quality of learning, leading to increased productivity and earnings.

Finally, the study is a significant attempt to examine how the various aspects of women's empowerment affect children's nutritional or health outcomes in Ghana. Leveraging the quantile regression technique that estimates the effect for children on the various points on the distribution of child health, this study tackles both undernutrition and over nutrition and supplies recommendations for improvement in child health. A recent study by Essilfie, Sebu & Annim (2020) used the quantile regression technique to examine the effect of mothers' empowerment (measured by mother's years of schooling relative to father's) on child health status using the DHS 2014 data. However, this thesis contributes to the literature on the relationship between women's empowerment and child health by employing a unique dataset that allows the author to control for other important variables not observed in the DHS data such as parental work hours, employment and household expenditure. Ultimately, the study makes suggestions that can inform policy on how best to enhance the bargaining power and agency of women. Ultimately, the study makes recommendations to improve the health of children via both the conventional determinants of child health and aspects of women's empowerment that are more amenable to child health.

1.6 Structure of the thesis

The thesis is structured as follows. Chapter one introduces the entire thesis by discussing the background of the study, problem statement, research questions, research objectives, the

[5] Two important sources of unobserved heterogeneity that are addressed in this study are (1) unobserved locality- and region-fixed effects and (2) possible unexplained heterogeneity due to differences in children's inherited abilities.

significance of the study and the structure of the entire thesis. Chapter two presents the relevant literature for all three objectives or themes of this study. Chapter three discusses the methodology employed for the study. The chapter describes the sources of the data which the study employed for the estimations and analyses. The chapter also discusses the empirical strategy and the models specified. Chapter four presents the results of the first objective: to examine the effect of women's political empowerment on welfare in Africa. Chapter five presents the findings of the second objective, which aims to examine the effect of women's empowerment on the cognitive development and academic achievements of wards. Chapter six presents the result of the third objective which examines the relationship between maternal empowerment and under-five nutrition or health status. Chapter seven concludes the study by summing up the salient research findings, detailing key conclusions and suggesting some recommendations. It also offers suggestions for future research focus.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discusses theoretical and empirical literature to provide a bird's-eye view of previous studies on the relationship between women's empowerment and welfare outcomes while highlighting the essential findings and identifying the gaps.

2.2 Theoretical Literature

The theoretical review of the literature begins with a discussion of the concept of empowerment, the various domains of empowerment and the challenges in measuring empowerment. Then, a discussion of how the political empowerment of women may affect the levels of socio-economic well-being is presented. The discussion is extended to household gender association theories and then narrowed down to the investment theories and the family stress theories.

2.2.1 Complexity, domains and measurement of empowerment

The recent focus on the relationship between women's empowerment and well-being among international development scholars is not only deserved but calls for a deeper enquiry into the possible gains from restoring gender equality (Laszlo *et al*., 2020). As a result, defining and measuring women's empowerment have become essential in current debates among cross-national development practitioners and scholars (Laszlo *et al*., 2020). A challenge, however, in assessing the relationship is how to define and measure such a complex phenomenon as empowerment adequately. Kabeer (1999) notes that it is crucial to think about women's empowerment as a process that involves improving access to resources, enhancing the exercise of choice and translating the options or choices into achievements. Bennett (2002) defines empowerment as "the enhancement of assets and capabilities of diverse individuals

and groups to engage, influence and hold accountable the institutions which affect them". Some key terms are often present or implied when defining empowerment, namely choice, options, power and control (Malhotra *et al*., 2002). Women's empowerment often refers to women's ability to make decisions, gain control over one's life, gain control over resources and influence outcomes of relevance to themselves and their families (Malhotra *et al*., 2002). However, women's empowerment is not based on only the individual or woman in question. Some authors have brought out the embeddedness or socially defined power relations and how they affect a woman's well-being.

For example, Sen (1993) explained empowerment as a process that alters relations of power, especially those that limit women's autonomy and options and negatively affect their health and well-being. Kabeer (1999: 437) defined empowerment as "the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them". This definition shows that empowerment must be viewed in terms of the ability to exercise one's agency in a system where one's agency is challenged. Such challenges may be intrinsic or socially defined. A typical household is a gendered system wherein the agency of women may be either enhanced or hindered. Thus, women's empowerment may occur along many dimensions, and the multidimensionality of empowerment needs to be taken into account.

Existing studies have argued to bring out different dimensions of empowerment. According to Malhotra *et al*. (2002), women's empowerment may occur along the economic, socio-cultural, legal, political, and psychological dimensions. The measurement of women's empowerment is bound to be challenging since the concept is a process that involves multiple dimensions and pathways. The challenge in defining and measuring women's empowerment is evidenced by the many instruments or proxies of empowerment.

2.2.1.1 Proxies for the economic empowerment of women

Economic empowerment of women is perhaps the most researched dimension of women's empowerment in the economics literature. It describes the extent to which women have access to economic or financial resources. Most existing studies on women's economic empowerment have examined the determinants and effects thereof at the micro or household level. Some measures used include women's control over income (Hoddinott & Haddad, 1995; Mayoux, 2001; Weber & Ahmad, 2014), women's access to and control of financial resources (Ashraf *et al*., 2010; Beegle *et al*., 2001; G. J. Bobonis, 2009, 2011; Grasmuck & Espinal, 2000), women's relative income share (S. Anderson & Eswaran, 2009), access to employment Basu & Basu, 1991; Tzannatos, 1999), ownership of land and other assets (Quisumbing & De La Brière, 2000; Roy Ana, Das, & Quisumbing, 2015), access to credit (Garikipati, 2008), access to markets (Ackerly, 1995) conditional cash transfers to women (Bonilla *et al*., 2017; Radel *et al*., 2017). At the national or cross-national level, usable proxies for economic empowerment using the proportion of women in high-paying jobs, representation of the economic interests of women in macroeconomic policies, federal and state budgets (Malhotra *et al*., 2002).

2.2.1.2 Proxies for social empowerment of women

The social context of women's empowerment is essential. It deserves consideration as it describes how women may be either restricted or allowed (by social norms) to take part in the overall construction of economic well-being (Aguinaga *et al*., 2013; Moser, 1995). In the literature, measures used to proxy for social empowerment include women's freedom of movement (Govindasamy & Malhotra, 1996; Kishor, 2000; Mahmud *et al*., 2012; Weber & Ahmad, 2014), lack of discrimination against women (Malhotra *et al*., 1995), women's visibility in and access to social spaces (Schuler & Hashemi, 1994), participation in extra-familial groups and social networks (Schuler *et al*., 1995), shift in patriarchal norms

(Malhotra *et al*. 1995), involvement in domestic decision-making (Hashemi *et al*., 1996; L. Liu *et al*., 2016; Malhotra & Mather, 1997) control over sexual relations (Wolff *et al*., 2000), ability to make childbearing decisions (Kabeer, 2001), usage of contraceptives (Owoo, Lambon-Quayefio & Onuoha, 2020) and control over spouse selection (Gage, 1995). Macro-level measures of social empowerment may include positive media images of women and women's access to a broad range of educational options (Malhotra *et al*., 2002).

2.2.1.3 Proxies for the political/legal empowerment of women

Political empowerment of women describes the process of ensuring that women have unrestricted access to various elements of power such as resources, capabilities, and positions (Budryte, 2014). Alexander *et al*. defined political empowerment of women as the facilitation of capabilities, achievements and assets of women to enable them to influence and exercise adequate political authority. According to Malhotra *et al*. (2002), political empowerment of women should include women's political knowledge, interest group activity, voting and representation in national, regional and local offices. Recent literature has noted the need to include women's political and legal rights (Coppedge *et al*., 2019).

Measures of political empowerment of women at the micro level include the extent of knowledge of the political system and how one can get access to it (Schuler *et al*. 1997), domestic support for political engagement (Hashemi *et al*., 1996). Other measures such as exercising the right to vote, knowledge of legal rights, and domestic support for exercising rights have not featured prominently in the development literature due to measurement challenges. Aggregated women's political empowerment measures include representation in regional and national bodies of government, representation of women's interests in effective lobbies and interest groups, laws supporting women's rights, access to resources, and options. Advocacy for rights and legislation; use of the judicial system to redress rights violations.

Notably, these aggregate measures of the political empowerment of women have not been explored due to data unavailability and measurement difficulties.

2.2.1.4 Challenges in operationalising empowerment

Challenges have characterised the operationalisation of empowerment of women both with its outcome and process. One key criticism that has been levelled in gender-related policies and programmes is the lack of a definition that is universally applicable. Women's empowerment is often conceptualised from the developed world or more western societies (Völker & Doneys, 2021). Thus, the context specificity of empowerment (i.e., regarding how the process or means available and the local obstacles one may face may differ from one context to the other) has not been duly addressed.

Context is essential to elucidate how empowerment is appreciated or understood and how cultural and local barriers can be shaped to its effective execution. Kabeer (1999) notes that factors that may indicate empowerment in one social or cultural context may have varying meanings in different contexts. O'Hara & Clement (2018) corroborate this assertion by finding that the forms of agency championed by international agricultural organisations may not always be consistent with local views of empowerment. Their study in Nepal reported that women who were engaged in the growing and selling vegetables at the local market were deemed to be empowered (increased agency or autonomy in control over income, decision-making and mobility). On the contrary to this view, the women themselves saw the carrying of agricultural produce to the market to be a daunting physical burden. The income they realised was also too low to effectively raise their bargaining power. In this case, it could be argued that the women's engagement in agricultural commerce instead strengthened their subordinate status within the household and society (O'Hara and Clement, 2018). These challenges may indicate how they ought to be prioritised.

In the same vein, a study by Meinzen-Dick, Rubin, Elias, Mulema & Myers (2019) noted that increments in women's income are often seen as empowerment (a facilitator of greater voice within their household) but could have adverse effects on family harmony. Such is often the case when conflicts between wife and husband arise, for instance, if the wives' earnings exceed that of their husbands. Some of the possible negative aftermaths of such disruptions (for example, social sanctioning and intimate partner violence) may outweigh the positive effects of the increase in income. This calls for other social arrangements that may be complementary to income generation. Ladič (2015), for instance, found that access to resources and economic development, which are often strong targets of empowerment programmes, do not necessarily have only beneficial effects on women's lives. In the study by Ladič (2015), domestic female workers in Rwanda with no access to running water opined that per their traditions, they were permitted to leave their houses to fetch water (and socialise other people). When they were given access to running water, they were no longer allowed to leave their compound.

The present discussion maintains that existing empowerment measures may not universally address the particular ways that women may be more empowered. Doneys, Doane & Norm (2020) noted that efforts to curb domestic violence may be vital in enhancing women's self-confidence and improving the efficiency of income-based forms of empowerment. According to de la O Campos (2015), the lack of social protection and formal health security in some countries that do not have insurances or basic public protections may weaken efforts towards women's empowerment. The United Nations (2015) review revealed that most empowerment measures or indices have strongly focussed on the economic status of women (in terms of labour force participation and income) and health statuses using data from the various DHS. These indexes are usually computed based on generally applicable indicators that are considered relevant and applicable for all countries, neglecting the context-specificity of

empowerment. Such measures have often seen a shift of women's focus away from their social groups or families toward a more individual orientation as a desirable aim of empowerment (Fierlbeck, 1995; Jackson, 1996). In reality, women in some cultural contexts may not aim for such individualisation and may face a backlash from society when they do. Although these types of indexes are not to be rejected, they ought to be supported with measures that aim to examine women's empowerment in distinct contexts. For instance, among Bangladeshi women, participation in microfinance programmes has been noted to be strongly associated with increased experience of both verbal and physical violence (Rahman, 1999).

Women have been considered mothers, wives and primary caregivers by neoclassical economists (Hewitson, 2013). Therefore, they may be relegated from actively taking part in decision-making in the household and may also experience restrictions in their mobility. Malhotra *et al.* (2002) noted that it is important to consider context specificity when discussing social empowerment. Members of the Ghanaian society traditionally attach huge expectations for every wife (a woman whose bride price has been paid by a man or the husband) to fulfil her reproductive obligations (Bawah, Akweongo, Simmons & Phillips, 1999). Thus, in terms of gender-defined roles in Ghana, women are seen as reproductive units of men with little expectatsion to contribute to the labour market (Tsikata & Amanor-Wilks, 2009). Women may find it challenging to decide on important issues such as their reproductive health issues, such as family planning, timing and pacing of birth, and total births. The social norms, beliefs and practices affect social relationships within societies and may also define acceptable behaviour within the family or otherwise. In contexts where social norms and culture uphold the supremacy of social ties, autonomy may not benefit women as they limit women's access to social support that are instrumental to women's overall reproductive healthcare access (Safi & Doneys, 2020). Also, the pursuit of more

independence (for example, financial autonomy) may not be seen as a desirable objective by women when family togetherness is valued (Doneys *et al*., 2020; Kabeer, 1999). This thesis is an attempt to consider how the various dimensions of women's empowerment affect welfare levels.

It is quite conspicuous that capturing aggregate levels of either a process or agency is more complicated. Most of the existing indicators tend to capture the enabling conditions or factors for women's empowerment, such as literacy, education, labour laws, characteristics of marriage, labour force participation and political representation by women. Indeed, most household surveys measure contextual indicators of empowerment at the community level, while just a few attempts have been made to measure individual women's involvement in political processes (Hashemi *et al*., 1996; Kabeer, 1998; Malhotra & Schuler, 2002). This implicit difficulty in measuring and analysing aggregated women's empowerment is worsened by the lack of adequate and consistent data on a comprehensive set of good proxies for most African countries.

Considering the measurement challenges and the availability of data, the thesis uses the political empowerment of women as the measure of empowerment for the macro-level analysis. Intuitively, the macro-level analysis focuses on how women's civil rights, liberties, and political participation may affect aggregate welfare outcomes. The second empirical chapter focuses on how women's economic and social empowerment may affect the cognitive development and academic achievement of children, adolescents, and young adults. The third empirical chapter examines how women's economic and social empowerment may affect the nutritional statuses of children under age five. It is important to note that political empowerment is not included due to the absence of a good proxy at the micro-level. However, the GSEPS dataset contains enough variables to measure both the economic and

social dimensions of empowerment. Hence, the rest of the literature review and the subsequent chapters are structured accordingly.

2.2.2 Women's political empowerment and welfare

There is some agreement in the development literature that the position of girls and women should be deemed a robust and evidence-based policy lever (Chant, 2016). The improvement in women's status is a quintessential element in public policy and contemporary development goals (United Nations, 2015; United Nations, 2008). Kanter (1977) introduced the idea of critical mass when assessing women's corporate participation in the USA. The study opined that when under 15 percent of the members of an organisation were women, they were often regarded as tokens, and gendered issues would be rejected and not addressed. However, upon reaching the 15 percent mark, the chances of forming alliances and addressing gendered issues improved. Dahlerup (1988) expatiated this idea by relating it to women's legislative situation in Sweden. She showed that women tokens had a reduced likelihood of assimilating within the legislative setting, but as their numbers appreciated, resistance to pro-women reforms decreased. Dahlerup (1988) argued that women could take part in "critical acts" to alter institutions and policies by forming alliances and mobilising appropriate resources (Childs & Krook, 2009; Dahlerup, 1988; Kanter, 1977). These initial studies led to the burgeoning literature that examines whether the share of women in legislatures (descriptive representation) affects the kind of policies they address (substantive representation). Descriptive representation implies the share of women in national parliaments. In contrast, substantive representation borders on the extent to which the needs of women are represented or addressed by the women in power. Thus, the substantive representation may be achieved by the passage of more women-friendly policies, lobbying for social interventions highly preferred by women and making laws to secure women's rights.

Some scholars have argued that male and female lawmakers vote differently, depending on their gendered interests (Swers, 1998); this is true even when political party and institutional factors are held constant (Kittilson, 2008; Meyer, 2003). Other studies have found strong associations between women's legislative representation and the passage of more women-friendly policies (Celis, 2007) as well as the initiation of children and women's rights bills (Kittilson, 2008; Meyer, 2003; Schwindt-bayer, 2006). The literature also demonstrates a positive association between women's legislative representation and social spending while it is negatively associated with poverty (Bolzendahl, 2009; Bolzendahl & Brooks, 2007; Brady, 2009).

A common motive for promoting women's political empowerment is a presumed connection between substantive and descriptive representation (Macmillan *et al*., 2018). Substantive representation is concerned with what policymakers do; it focuses on the extent to which the interests of their constituents and members of other groups are represented by politicians (Wängnerud, 2009). Descriptive representation focuses on the similarity in composition between those in leadership roles and those being represented or led; it is also concerned with the degree to which political entities adequately reflect the demographic diversity of the relevant populace (Dovi, 2015; Fain, 1980).

These two types of representation are connected to the degree that leaders may be better able to safeguard group interests formed through similar or shared experiences (Mansbridge, 1999). Political theorists ask two sequential questions (Wängnerud 2009). First, do women have particular shared interests? Studies attempting to conceptualise or gestate women's interests have concurred that gender orders such as the gendered division of labour, so to some extent, bring about specific needs that are shared over otherwise diverse female groups (A. Phillips, 1998; Young, 1994, 2002). Interests and needs that are amenable to policy such as education of and care for children, health, sexual and gender-based violence, childbearing,

and access to paid labour may feature prominently in a broad set of women's political interests.

Second, why would female politicians better represent or safeguard the interests of women? Some compelling arguments have dwelt on the effects of institutional and historical exclusions that limit fair access to a platform where ideas are somewhat contested (A. Phillips, 1994). Studies over different geographical settings and periods consistently find that females in political positions often prioritise issues that are considered to be of particular interest to women, including gender equality issues, family policy and social welfare policy (Childs & Krook, 2008; Jones, 1997). For example, studies conducted in the United States revealed that "women were more likely to give priority to public policies related to their traditional roles as caregivers in the family and society—e.g., policies dealing with children and families and health care" (Carroll, Dobson & Mandel, 1991; Esarey & Schwindt-bayer, 2017). Evidence also suggests that increases in female politicians are associated with greater spending on social programs (Bolzendahl, 2009; Bolzendahl & Brooks, 2007; Brady, 2009; Halim, Yount, Cunningham & Pande, 2016).

However, other scholars have argued that women's representation alone does not influence legislative behaviour. They opine that party affiliation, loyalties and dominance (Childs & Krook, 2009; Grey, 2002; Poggione, 2004) and institutional structures (Childs & Krook, 2009) affect women's legislative behaviour. Some further suggest that women's influence on policy outcomes and implementation is unclear (Grey, 2002; Schwindt-bayer, 2006). Therefore, related studies in developed countries demonstrate a link between substantive and descriptive representation within the legislature and this relationship depends on institutional structures, critical actors, political parties, and loyalties.

2.2.3 Household Gender Association Theories

Household gender association theories have explained the relationship between women's status and household production efficiency and the eventual effect on the socio-economic well-being of household members. They have sought to examine the interactions, competition, cooperation, and conflict amongst household members. These include the new home economics theories and the neo-classical economic theories of the home. The neoclassical economic theory of the home examines the household as an entity with a utility function. Advocates contend that the entire household comprising the father, mother, and children behave and act to maximise the family's single utility, as those actions are mainly based on their comparative advantage (Becker, 1981; Schultz, 1990).

In the household, cooperation in gender relations has become an issue raised by feminists, as social adherence has been made to reflect women's position as subordinates (Eisenstein, 1984; Kabeer, 1994). The more critical theorists such as the dependency theorists and neo-Marxist theorists are of the perspective that gender roles are propelled by structural scarcity, arguing that economic misappropriation and the relegation of women from taking part in households' economic decisions are inroads to husbands meting out bad treatment to their wives (Savane, 1986). Other development sociology and economics theories posit that socially determined and gender-based labour discrimination leads to the subordination of wives. Maternal unearned labour is also posited to be a way of women's disempowerment and subordination (International Labour Organization, 2017). Socialising people into stereotyped gender roles has become a way of constricting women's capability and altering their expectations, choices and character (Kabeer, 1994).

New Home Economics theorists suggest that investment in female education to enhance their human capital and technological know-how is a viable solution to poor well-being. Other theories have focused on gender roles to explain the importance of altruism, selflessness, domination and power in household production (Baker & Nelson, 1987; Ellis, 1988). They

acknowledge that altruism may be present in a household and can be highly associated with a mother's preferences compared to those of the father. They see it to be easier for the relatively less influential persons, primarily girls and women within a household, to forego their individual's needs in favour of the welfare of other members in the household (Kabeer, 1994).

Allowing the entrance of conflict and cooperation relationship illustrated by empirical findings, the home may also be viewed as a site with conflict and cooperation (Sen, 1990). Cooperation occurs when family members or individuals combine resources to produce commodities for usage. Conflicts may, however, occur when sharing the commodities between individuals. The cooperative conflict paradigm attributes non-investment in human capital to differences in bargaining power and autonomy among the household members, especially women. As a result of the lack of investment in human capital, production may become inefficient. Thus, increased efficiency is associated with gender equity (Bardhan, 1995; Folbre, 1995). According to Sen (1990), access to employment and income affords women increased household resource control (Sen, 1990).

2.2.4 Child development theories

The existing literature on child development outcomes is captured under two main theories, namely the household decision-making theory spearheaded by Becker (1981) and Becker and Tomes (1986) and the family stress theory proposed by Smith and Brooks-Gunn (1997) and Yeung *et al*. (2002).

2.2.4.1 The household decision-making theory (investment theory)

The investment theory postulates that parents are concerned about the survival and prospects for the well-being of their children or wards, and this propels them to invest both material inputs and time input in their children's human capital and increase their future earnings.

These include goods and services such as food, housing, neighbourhood environment, schools, stimulating learning materials and activities, child care and medical care. This means that parents derive some satisfaction from doing so and thus seek to maximise their utility. Low-income families, however, are often challenged in financing investments in children due to the unavailability of loans to supplement their insufficient resources when human capital is the collateral. This capital market restriction leads to reduced investments in children from poorer households.

Economic models of household decision making and how investment decisions are taken can be split into two: the unitary and cooperative bargaining models. Per the unitary model, couples maximise one utility function subject to a budget constraint that pools all incomes. The unitary utility function signifies either the joint objective of both spouses with identical preferences or a spouse's utility function. The spouse has sole decision-making power and demonstrates altruism towards the other spouse (Malapit & Quisumbing, 2015a; Quisumbing & Maluccio, 2003). For example, consider a husband and a wife with incomes $\mathrm{I_m}$ and I_f where these incomes are spent on the wife's private consumption x_f, the husband's private consumption x_m, and a public good C (such as expenditures on children). The optimum solution from the unitary model can be obtained from solving the following maximisation problem:

$$max_{x_f, x_m, C} \left\{ U\left(x_f, x_m, C\right) \right\} \quad (1)$$

subject to:

$$x_f + x_m + C \leq I_f + \mathrm{I_m}$$

This formulation has been critiqued by the cooperative bargaining models that posit that the distribution of income between husband and wife may not be equal, and this affects decision-making outcomes (Anderson & Baland, 2000; Basu, 2006; G. J. Bobonis, 2009; Browning, Chiappori & Lechene, 2004, 2010). In other words, the cooperative bargaining models posit that a conflict of interest may exist between the spouses. Each spouse, therefore, has different preferences and utility functions; since their preferences are likely to differ, they may have to bargain for a decision to be arrived at. The optimum solution from the cooperative bargaining model can be obtained from solving the following maximisation problem:

$$max_{\ x_f, x_m, C, \delta}\ \left\{\delta u_f\left(x_f,\ x_m,\ C\right)\right\} + \left\{(1-\delta)u_m\left(x_f,\ x_m,\ C\right)\right\}, \text{where } \delta\ \in\ [0,1]$$

subject to: (2)

$$x_f\ +\ x_m\ +\ C \leq\ I_f\ +\ I_{\mathrm{m}}$$

δ captures the wife's share of the household bargaining power. The household seeks to maximise a weighted average of the two utility functions, and the weights capture the power balance in the household. One key advantage of cooperative bargaining models is the Pareto optimum solution. As such, the outcome of any cooperative bargaining model can have different weights on husband and wife that represent their relative bargaining power (K. Basu, 2006; S. Lundberg & Pollak, 1993).

In summary, the unitary model argues that parents would have a similar objective which is to maximise their welfare outcomes. Any additional funds made available for public good investment would enhance the pool of household resources from which public good investments are financed. However, the cooperative bargaining model allows women to have different preferences that may affect child welfare differently. A caveat, however, is that

when the husband and the wife earn have different wage rates, their time preferences may also differ, and that could impact the quality of learning of the child through its effect on the quality of mother-child interactions. For example, a higher wage rate might reduce parental interaction with the child or ward because of the higher value of time. However, this substitution effect might be offset by the income effects. The net effect will depend on the relative size of the two effects. Hence the direction of the effect of economic empowerment of women is not determined a priori.

2.2.4.2 Family stress theory

Family stress theorists argue that factors that influence the livelihood of parents also affect their psychological well-being. Therefore, economic hardship would adversely affect the psychological well-being of parents. Hardship is believed to worsen maternal emotional distress, which, in turn, is related to an increase in harsh punitive practices. Smith & Brooks-Gunn (1997) demonstrated that economic difficulties reduce parental abilities to give responsive, warm parenting and lead to parents resorting to the use of harsh punishment. Warm, non-abusive parenting practices fender children from some of the negative effects of economic hardship (Mosley & Thomson, 1995). This means that psychologically stressed parents may be less able to perform their function of practising an effective parenting style that supports and sustains child development (Smith & Brooks-Gunn, 1997; Yamauchi, 2010; Yeung, Linver & Brooks-Gunn, 2002).

In sum, the model used in this study combines the investment perspective (ability to invest in a conducive home environment, materials and services) and family stress theory (playing up the role of parenting practice, stress and mental health) to provide valuable insights into why parental investment and stress might affect child development. This study argues that empowered women can afford better investments for their wards, resulting in their development. If empowered women have the liberties to spend on their children or make

decisions on their own, more of their spending decisions would be directed towards the development of their wards. Also, when women experience violence and abuse in the home, their stress levels are increased, which can worsen the quality of interaction with children and other parenting practices. The study also examines how social empowerment affects the cognitive development of her child. It argues that social empowerment provides social support that can reduce stress levels such as freedom of movement, expression of opinion and free contact with the family. This study, therefore, examines the effects of mothers' social empowerment and economic empowerment on their children's cognitive achievement and academic achievement.

2.3 Empirical Literature

The section discusses the empirical literature that relates to the empowerment of women and welfare. The first part discusses the literature on the relationship between women's political empowerment and welfare. The second part discusses how women's empowerment affects the cognitive development and academic achievement of their wards. The third part provides a review of studies on how women's empowerment may be associated with the nutritional statuses of their children.

2.3.1 Women's political empowerment and welfare

2.3.1.1 Women's political empowerment, health and education

Burchi & Singh (2020), using individual and district-level political data, conclude that a percentage point increase in women's political representation produces a 0.6 percentage point increase in children's primary school completion probability. They also found that women's political representation affects girls' education more significantly than boys' education. While the findings reflect the importance of the "role model" effect, an increase in educational infrastructure did not appear as an important mediating factor. In contrast,

women's access to educational programmes such as the Mid-Day Meal scheme was an important mediating factor. The study noted the increased likelihood that more developed districts would have higher female political representation and invest more in education. Therefore, the percentage of district constituency contestants who won in close male-female election contests was used as an instrument for the proportion of district seats occupied by women in elections where there was a narrow gap between the winner and the runner-up.

Homan (2017) examined the effect of political gender inequality on population health (proxied by the U.S.A. infant mortality rates). Using administrative data with random-effects and fixed-effects estimation techniques, it was found that a greater share of women in state legislatures is associated with a reduction in infant mortality rates, both within-states and between states. Specifically, they found that if women had a similar share of parliamentary seats as men in state parliaments, the expected infant mortality rate in the U.S. would have been about 14.6% (3,478 infant deaths) lower, showing that women's political representation is important for population health. This finding meant that elected women are likely to use their political authority to benefit the poor, women, children, and people's overall public health in the U.S.A.

Swiss, Fallon & Burgos, (2012), using a sample of 102 developing countries over the period 1980 to 2005, employed random effects panel regression to examine the effect of women's representation on child health (proxied by measles immunisations). They found that countries that meet a 20 percent threshold of female representation, compared to those with no women in their national legislatures, experience increased rates of DPT immunisations (12 percentage points), measles immunisations (10 percentage points), child survival (1 percentage point) and infant survival (0.7 percentage points). This effect was observed to be higher in economically and socially disadvantaged countries.

Bhalotra & Clots-Figueras (2014) examined whether women's representation in national parliaments improves the public provision of childhood and antenatal health services in their respective elective districts. They argued that the cost or effect of weak child and maternal reproductive health services falls disproportionately on women. This cost comprises maternal mortality, poor quality antenatal and postnatal services, child mortality and poor child health in general. According to this study, the gender of an elected leader may be correlated with the preferences of voters and hence, may be endogenous. Also, birth compositions may be endogenous to different political regimes. These biases were addressed using fixed-effects with the instrumental variable estimator (the instrument used was the share of females who win in closely-contested elections against men). The results showed that a one percentage point increase in the share of women in parliament reduces neonatal mortality by 0.21 percentage points. This meant that female politicians are more likely to lobby for public health facilities and promote antenatal care, delivery in formal health institutions and immunisation. They concluded that women's political representation could be an underused instrument for improving health in developing countries.

The studies reviewed have all found the impact of female political representation on development outcomes to be positive. Most studies that examined the effect of women's legislative representation on health outcomes found evidence that health outcomes are greatly enhanced by having a more substantial female political presence. This relationship is due to women's strong preference for social policy or interventions. Thus, political empowerment of women leads to increased lobbying and investment in welfare-enhancing social interventions. Outcomes such as neonatal mortality (Bhalotra and Clots-Figueras, 2014), infant mortality rates (Homan, 2017), vaccination statuses of children (Quamruzzaman & Lange, 2016; Swiss *et al*., 2012) are positively related to women's political empowerment. The reviewed studies,

thus, find a robust positive association between the descriptive representation of women and their substantive representation. Other studies, however, found inconclusive results.

For instance, Clots-Figueras (2012) examined whether district residents' educational level depends on women's political representation shortly before they enrolled in primary school. Indian data collected on politicians was matched with individual data to create unique data for the analysis. The data on politics also allowed the identification of closely contested elections between women and men. This formed the basis of their quasi-experimental setup that was employed to examine a causal effect. The study found strong empirical evidence of a positive association between residents' educational level and women's political representation shortly before enrolling in a primary school in urban areas. However, this effect was not significant in rural areas, signifying that women assigned greater importance to education in urban areas where the expected returns from education are higher.

Boehmer & Williamson (1996) also examined 96 developing countries around 1990 and found that the percentage of women in parliaments had a small negative association with infant mortality. The study by Wängnerud & Sundell (2012) sought to explain contemporary variations in gender equality at the sub-national level in Sweden. Using six development indicators (Unemployment, poor health, paternal leave, full-time employment, poverty and income), the overall finding was that having an increased share of elected female leaders reduced gender-based disparities regarding income levels and full-time employment. Factors such as poor health, unemployment and poverty were not significantly affected by the share of female leaders.

Quamruzzaman & Lange (2016) explored the extent of female political presence in national parliaments on children's health through a multilevel analysis. Demographic and Health Survey data from 51 low- and middle-income economies and longitudinal data formulated from multiple surveys in 20 countries. Female political representation was adversely

associated with infant mortality and was directly related to the measles vaccination statuses of children. It was also found that the association between child health and political empowerment or representation of women is partially mediated by state spending, accounting for a small portion of the effect.

The findings of Quamruzzaman & Lange (2016) also meant that political empowerment does not have affect infant mortality. Instead, it is state spending that affects child health. Boehmer & Williamson (1996) found a fragile association between the descriptive representation of women (percentage of women in parliaments) and their substantive representation. Also, Clots-Figueras (2012) found the association between the descriptive representation of women and their substantive representation to be weak. Moreover, most of the essential elements of women's political empowerment, such as women's rights, agency and civil society participation, have been omitted from the majority of the existing studies as only the percentage of women in parliaments has been used as a proxy for women's political empowerment. Thus, this study makes a valuable contribution to the literature on women's political empowerment by using an improved measure of women's political empowerment.

2.3.1.2 Women's political empowerment and household income

It is striking that even fewer studies have examined how women's political empowerment may affect household income, household expenditure, and women's ability to contribute to household expenditure. For instance, Beaman, Duflo, Pande & Topalova (2012) used a randomised natural experiment in India to show that female leadership affects adolescent girls' educational attainment and career aspirations. The experiment was a law in 1993 that reserved leadership positions for women within randomly chosen village councils. They sampled 8,453 adolescents aged 11 to 15 years and their parents from 495 villages. The study found that compared to the areas without such reservations for women on the village councils, the gender gap in aspirations contracted by about 25 percent in parents and about 32

percent in adolescents within the villages where female leaders were assigned for two election cycles. The study also found that adolescent educational attainment became more balanced as the gender-based gap was erased in the villages where female leaders were assigned. It is worth noting that the girls spent less time on household chores in those villages.

A study by Ghani, Mani & O'Connell (2013) examined whether women's political empowerment affects their employment statuses and their earnings. Drawing from a mandatory political representation reform for Indian women, the study found the length of exposure to female politicians to be a factor that affects overall female labour force participation. This effect occurred via a direct channel where women's political representation directly influenced the hours of work assigned to women. The indirect channels for this effect were resulting increments in public good access, increased likelihood of women being involved in labour supply as women were exposed to female leaders over time. Thus, women's political participation could be an essential policy tool to boost both the demand for and supply women's labour market opportunities. This can boost earnings and enhance household incomes and expenditure levels.

Another study by Iyer, Mani, Mishra & Topalova (2012) examined how some enabling work conditions that can boost women's decision to engage in employment are affected by women's political empowerment. Specifically, by examining different political reforms in female representation in India, the authors found that increased female representation in local government brings on a significant rise in reported crimes against women. This finding, they explained, was welcomed as it meant that the political reforms made it easier for women to report crimes perpetrated against them, creating an enabling and safe environment for women to work. There was no evidence of an increase in crimes perpetrated against men or other gender-neutral crimes. They also found that the form of political representation matters.

Specifically, large-scale female membership in local councils influences crime against women, whereas their presence in other higher-level leadership positions does not affect crime.

It can be hypothesised that when women's political representation is increased, it affects the capacity of women to contribute towards household incomes. This is through its effect on young females' health and educational attainment, making them more productive and able to earn more (Beaman *et al*., 2012). Besides, women in power promote reforms that create an enabling environment for women to work and serve as "role models" to other women (Ghani *et al*., 2013; Iyer *et al*., 2012). This boosts their capacity to contribute towards their household incomes.

2.3.1.3 Conclusion

In summary, the literature on the politics of presence posits a strong link between substantive and descriptive representation. The empirical literature, however, presents equivocal evidence. Some studies found a strong positive relationship (Celis, Childs, Kantola & Krook, 2008; Phillips, 1995; Wängnerud, 2009) while others remained inconclusive (Clots-Figueras, 2012; Boehmer & Williamson, 1996; Quamruzzaman & Lange, 2016). Clots-Figueras (2012) found a positive association in only the urban areas. Also, Boehmer & Williamson (1996) found that political empowerment of women reduces gender-based disparities in employment and income levels while other outcomes (poor health, unemployment and poverty) were not significantly affected by women's political empowerment. A further empirical examination of the circumstances under which improved women's political empowerment levels affect welfare might help make better meaning of equivocal evidence. Most of the existing studies have also been conducted in developed countries, save a minimal number of studies cited in developing countries; The African context has received even lesser attention. This study is an ardent attempt to fill these lacunae in the literature.

2.3.2 Women's empowerment, quality of learning and child health outcomes

This section of the literature review discusses how mothers' economic empowerment and social empowerment statuses affect their wards' education and health outcomes. The various proxies for economic empowerment considered herein in this review are maternal employment status, asset ownership, savings and maternity leave policies. Social norms also influence women's agency and bargaining power and how their preferences may reflect household allocation decisions. This review covers how social norms that affect the agency of mothers may affect the education and health outcomes of their wards.

Women's economic empowerment has been linked with child welfare outcomes such as child survival, improved child nutrition and immunisation. A large part of the literature in economics has shown that a child's cognitive as well as non-cognitive development is determined by the extent of family inputs that are invested in children (Aizer & Cunha, 2012; Carneiro & Heckman, 2003; Cunha, Heckman & Schennach, 2010; Heckman *et al*., 2010; Ramey & Remey, 2009). Although cognitive abilities are formed in the early years, they have substantial implications for children's later life outcomes such as academic achievement, labour quality, and earnings. The ability of parents to invest in child outcomes depends on the resources available and how they are managed or controlled. A sizeable literature has also considered associations between different measures of women's economic empowerment and child education. Existing studies, using measures of economic empowerment such as the mother's employment status, land ownership, and ability to save, have found inconclusive results when examining the impact on learning outcomes.

Hoffman (1980), using the 1979 United States of America census data, found measurable differences in academic performance and other measures of children's well-being, depending on maternal employment status. Indeed, if maternal employment makes a difference to the ward, it is likely to be exhibited in the parent-child relationships. For example, Nock and Kingston (1988) found differences in the amount of time parents spend with their children

depending on maternal employment status. However, the differences were most pronounced for parents of pre-schoolers and in non-child-centred time. There are many different ways for parents to be involved with their children and parents may become involved differently depending on the resources available to them (Lareau, 2000; Muller, 1993). According to Lareau (2000) and Muller (1993), different forms of parent involvement have different consequences for the child.

Muller (1995), using data on 13,881 students and their parents from the National Educational Longitudinal Study, found mother's time in the labour force to be associated only with the amount of unsupervised time after school. Children perform better on base-year achievement tests when mothers are employed part-time or not employed; however, the latter can be explained entirely by reduced unsupervised time after school. Bogenschneider and Steinberg (1994) examined whether maternal employment affects school achievement and under what conditions the effect occurs among high school students. It was found that among 2,571 White adolescents who lived with both parents, the effects were heterogeneous for children who belonged to different class and gender. Boys in the upper middle-class and middle-class whose mothers were working full time reported lower grades; for boys in the upper middle-class, both mother's employment during the survey and earlier employment (during the preschool years) had negative association with grades; for girls in the upper middle-class and middle-class, mothers' contemporaneous employment had no effects of their grades, while lower high school grades were reported when their mothers engaged in full time work during their preschool period.

These earlier studies can be critiqued to have ignored two possible challenges that may inhibit the inference of causality, namely, unobserved heterogeneity and reverse causality. The first possible challenge is unobserved heterogeneity, which may arise due to non-measured factors determining or affecting maternal labour supply and child outcomes. Such

factors may include productivity, motivation and ability. The second issue is the possibility of reverse causality between child outcomes and maternal employment. However, it is reasonable to assume that the direction of causality is more likely to be from maternal employment to child outcomes. For instance, a mother may cut down on her hours of work to help a child who is achieving below the expected outcome (such as poor school performance). However, the typical reaction to such a problem would be teachers' engagement to offer additional home-based tuition. To go around these issues, two groups of studies emerge. The first group employed quasi-experimental designs using maternity leave policies as the source of exogenous variations (and as a proxy for women's economic empowerment[6]), while the second group used instrumental variable approaches.

Among the quasi-experimental studies, Liu and Skans (2009) found that an increase in maternity leave periods resulted in improved test scores and grades for children aged 16 years whose mothers were highly educated, while no significant effect was found for children of mothers with low levels of education. Danzer and Lavy (2017) examined whether the duration of maternity leave affects long-term human capital outcomes in Austria. The study found that increased maternity leave duration positively affects male children with highly educated mothers. However, the effect for male children with lowly-educated mothers was negative. However, four studies using data from Canada, Denmark and Norway data found that increased maternity leave period has not impact on child outcomes, mainly secondary-level education test scores (Baker & Milligan, 2010, 2011; Dahl *et al*., 2016; Rasmussen, 2010).

Carneiro *et al*. (2015) examined the effect of a change in maternity leave entitlements in 1977 in Norway on children's wages at age 30. They found that when more time is spent with the

[6] It is assumed that pregnancy and other childbirth-related disruptions in the labour supply of women do not only discourage women from working but also serve as a reason why male employees may be preferred at the work place. The institution and enforcement of mother-friendly policies such as maternal leave may serve as a source of economic empowerment.

child, the child experienced a five percent increase in wages at age 30. A study by Dustmann and Schönberg (2012) evaluated the effect of expanding the coverage of maternity leave policy in Germany on the highest educational attainment (by age 28 to 29) and earnings (at age 28 to 29). They compared the outcomes of children born before and after reform and found no evidence of improvement in children's outcomes. Bettinger *et al*. (2014) examined how a 1998 reform in Norway that incentivised parents with children under age three to stay home impacted the educational outcomes of older children of the affected mothers. They found a small positive effect on the grades of the older children who were in secondary school. The mixed results of this first group of studies can be partially attributed to the different institutional contexts in the countries and periods in focus.

The second group of studies employ data from social surveys, where mothers' work information is matched with child outcomes. Strategies employed include the addition of a large number of covariates such as exogenous maternal background characteristics (Baum, 2003; Berger *et al*., 2005; Ruhm, 2006, 2009), mother-specific fixed-effects in an attempt to control for time-fixed factors that can influence both maternal employment decisions and maternal parenting style (Ermisch & Francesconi, 2013; James-Burdumy, 2005; Schildberg-Hoerisch, 2011; Waldfogel *et al*., 2002). A few studies attempt to address the possible "two-way" causality between maternal supply of labour and child outcomes with the use of time and geographic differences in local labour market conditions (specifically, differences in labour market frictions) as instruments for mothers' employment (Baum, 2003; Ermisch & Francesconi, 2013; James-Burdumy, 2005).

Ermisch and Francesconi (2013), with a sample of over 1,000 children in the British Household Panel Study (BHPS), examined the impact of maternal employment on the likelihood of her children qualifying for upper secondary-level education. The authors use local labour market conditions to instrument for maternal employment. They find a negative

impact of full-time maternal employment (during the period when the child was between age one and five) on the likelihood that the child would qualify for upper secondary education. The authors argue that this finding is significant for two reasons. Firstly, parental investments are essential in the first year of a child's life and preschool. Secondly, early parental investments positively affect a child's later-life achievements.

Using the German Socioeconomic Panel (SOEP) data, Schildberg-Hoerisch (2011) found no effect of maternal employment within the first three years of a child's life on the likelihood that the child is enrolled in academic-track secondary schooling and not a vocational school. To avert possible reverse causality, the author excluded children with meagre ability and disabled children from the analysis since such children can cause a mother to reduce hours of work or to stop working altogether and spend the additional non-work time with the child. Similar results were found by Del Boca *et al*. (2016), who examined the effect of formal child care during a child's early years of life and maternal employment status on children's school grades later in life. Using the 2008 Italian ISFOL-PLUS dataset, they found that mothers' employment status (during early childhood) did not affect the probability that the respondent would have high grades at the end of high school.

Other studies have findings that differ from those reported above. For instance, Mosca *et al*. (2017) examined the effect of a "Marriage Bar" (a ban which required women in specific jobs or sectors to stop working after marriage with the possibility of resuming work only after several years) on school completion. Using the third wave of the Irish Longitudinal Study on Ageing, they found that children whose mothers were affected by the Marriage Bar, compared to those whose mothers were not affected, had seven percentage points higher likelihood of completing university education. This was mainly attributable to mothers' increased opportunity to spend more time with children due to the Marriage Bar.

Another proxy for women's economic empowerment is the ownership of assets such as house(s) and land (Calero *et al*., 2009; Nam & Huang, 2009; Quisumbing, 2003; Shimamoto & Gipson, 2017). However, a minimal number of studies have examined the effect of mothers' asset ownership on child educational attainment, as much of the attention has focused on parental asset ownership or household asset ownership (both financial and non-financial) schooling achievement children. Using the Panel Study of Income Dynamics (PSID) data, Conley (2001) gives evidence that the effect of wealth can be distinct from income in predicting children's higher education attainment. Using logistic regression Conley (2001) found that income loses its significant effect on children's post-secondary education after controlling for net worth. Parents' net worth significantly positively affects college attendance, years of schooling, and post-high school education. However, no significant effect was found on the attainment of a bachelor's degree and postgraduate schooling. Nam and Huang (2009), using different types of assets in the PSID data, provides evidence that liquid assets are positively and significantly associated with college attendance (using ordinary least squares (OLS) regression) and high school graduation (using probit regressions). Additionally, the authors found that family income significantly determines college graduation.

The use of assets as a proxy for the economic empowerment of women has not produced straightforward results. For instance, Quisumbing (2003) examined the effect of assets at marriage (as a proxy for bargaining power) on the share of education expenditure in household expenses using data from Indonesia, Bangladesh, Ethiopia and South Africa. The study found different results for different countries. For instance, in Bangladesh and South Africa, women's assets enhanced expenditure shares on education, while it had no effect in Ethiopia. Hallman (2003) also found that women's asset ownership increases girls' schooling

compared to boys' schooling. Also, assets may not readily affect the ability to spend on wards' education as income levels would (Doepke & Tertilt, 2011).

Huang *et al.* (2010) examined two theories, namely, long-term family background and short-term borrowing constraints, using a sample of 650 young adults captured within the PSID data. Using probit regressions, the authors found both assets and income in early childhood to be significantly associated with the probability of children's college entry. They also revealed that household assets during late adolescence significantly predicts children's college entry. The findings suggest that household assets provide crucial financial support for families and, thus, ensures the opportunity available for children to attend college. They also found that liquid assets during early childhood indirectly affected the likelihood of children's college entry via its effect on the child's academic ability. This means that liquid assets may work by promoting educational investment for children, which boosts their chances of college entry.

Zhan and Sherraden (2003), using data from the National Survey of Families and Household and logistic regression, found that savings of at least $3000 positively affects the likelihood that children will graduate from high school. The study also found that owning a house is significantly associated with children's academic performance in high school using OLS regression. However, the income (savings) effect is rendered insignificant upon adding assets to the model.

Orr (2003) used a sample of children aged between 5–14 years in NLSY79 data and found that family net worth has a positive association with mathematics test scores, while also revealing that the achievement test score discrepancy or gap between African-Americans and Whites is significantly reduced after controlling for assets. The author emphasized that the type of assets matters, revealing that income-producing assets or liquid assets (such as financial assets) are significant predictors, unlike non-income-producing assets (such as houses and vehicles). This effect is due to the relative ease of channelling liquid assets

towards investment in education. Also, the African-Americans were noted for having low levels of liquid assets, making them less able to carry out optimal human capital investment. The impact of assets was mediated by cultural capital opportunities (proxied by outings or extra-curricular activities).

Orr (2003), with some auxiliary analyses using different age groups, also showed that social capital (measured by parental assistance in homework for children aged at least ten years and parents' reading frequency for children aged 5–9) has a positive relation with younger children's academic achievement, while the association is negative for older children. This means that parents' involvement in their children's education, as well as other educative activities for themselves, may have a different effect on children of different ages or academic abilities. However, the reverse may be the case as children's academic struggles in higher grades may necessitate a higher degree of parental involvement. With the same data, Zhan (2006) found a positive association between parental net worth and children's reading and math test scores on the Peabody Individual Achievement Test (PIAT). However, no mediation effects were found from parental involvement.

Kim and Sherraden (2011) examined the impact of parental assets on children's educational attainment from the time of high school completion to the time of college degree attainment. They assessed possible mediating roles of child's self-esteem, child's educational expectations and parental involvement. The study sample of 632 respondents is drawn from the Child and Young Adult data supplement to the NLSY79. The results showed that home-ownership and financial assets are significantly related to high college attendance (using OLS regression) and school completion (using logistic regression). Also, family income was rendered insignificant when assets and liabilities were controlled for, while non-financial assets and income significantly predicted the likelihood of college degree attainment. The educational expectations of children were also found to mediate the impact of financial assets on

completing high school. Zhan and Sherraden (2011a) further assessed how parents' assets, liabilities, and educational expectations predict children's college degree attainment while paying particular attention to the influences of financial, non-financial assets and liabilities (secured and unsecured debt). After controlling for parent/child characteristics and family income, both financial and non-financial assets positively predicted children's college completion, while unsecured debt negatively predicted children's college completion.

Another aspect of economic empowerment, aside from having assets or sources of funds to enhance a woman's bargaining power, another dimension of women's empowerment is a woman's autonomy to spend on herself or her family when she earns something on her own. Experimental evidence of women's increased earnings on women may not unanimously improve child welfare. Using Progresa (the Mexican cash transfer programme) as an exogenous intervention, Rubalcava *et al*. (2009) argued that higher income, when handled by women, leads to improved child outcomes such as higher secondary school enrolment rates proportion of budget spent on children's clothing. Other authors have shown, using later editions of the same programme, that when an increase in earnings of women and transfers may hurt the egos of husbands and increase the levels of aggressive behaviour and violence from husbands (Angelucci, 2008; Bobonis *et al*. 2013). The evidence is not straightforward as gains in child welfare may be reduced by maternal stress and reduction in the quality of mother-child interaction. This section also considers how elements of social norms, beliefs, and practices affect a woman's agency and how this effect may reflect on the welfare outcomes of her children or wards. Social norms affect the autonomy, mobility, decision-making participation and the agency of women in general. Some studies have associated mobility of women with increased investment in health inputs such as usage of contraceptives (Hashemi *et al*., 1996), while some studies have reported that the said effect is insignificant (Moursund & Kravdal, 2003). Limitation in women's mobility has also been linked with

increased levels of intimate partner violence (Gibbs *et al*., 2017). The literature also reports a possible effect that mothers' freedom of movement could have on the demand for health inputs for their children. For example, Ebot (2015) and Moursund & Kravdal (2003) associate women's mobility with children's immunization status.

However, very few studies have considered the relationship between the mobility of women or mothers and its effect on child welfare outcomes. The mobility of women could improve the welfare of women and their children along two main dimensions. First, freedom of movement (the ability to take vacations, sight-seeing trips as well as the intrinsic and satisfying feeling of being able to decide where to go to and at what time) enhances peer association and could serve as a source of stress relief which could improve the quality of mother-child interactions and ultimately, the cognitive development of children. Besides, there is evidence that the quality of mother-child interactions is a positive predictor of cognitive development (Tamis-LeMonda, Shannon, Cabrera & Lamb, 2004). Second, the mobility of women and its related boost to peer and family association could also serve as a source of informal education on pertinent issues such as feminine health and child health matters.

Gebremedhin & Mohanty (2016) studied how maternal autonomy affect child schooling in Ethiopia, using the Ethiopian Demographic and Health Survey. The results showed that maternal freedom to leave home and to visit family and friends is significantly associated with increased child school enrolment and reduced likelihood of having a bad grade for age. They explained that maternal freedom of movement and family visits provide opportunities to exchange information and ideas to improve the well-being, including schooling outcomes, of children. Alternatively, having autonomy of movement signifies high bargaining power in the household and the ability to influence resource allocation to enhance her wards' schooling.

Luz & Agadjanian (2015) examined the relationship between rural women's decision-making autonomy and enrolment status of primary-school-age children living in their households and how this relationship differs by child's gender. Using Multilevel logistic models and data from a 2009 survey of rural households in four districts of Gaza province in southern Mozambique, results show a positive association of women's decision-making autonomy with the probability of being enrolled in primary school for daughters, not for sons. Chakraborty & De (2012) have assessed the effect of mothers' decision-making on the education (secondary school enrolment or probability of dropping out) of their children in Mexico. They found that the children of mothers with greater domestic decision-making participation have higher secondary school enrolment and a much-reduced likelihood of being a secondary school dropout.

Regarding the relationship between women's empowerment and children's health or nutritional status, some studies have established significant positive relationships between the nutrition knowledge levels of mothers and their children's nutritional statuses (Glewwe, 1999a; Webb & Block, 2003). Others have found significant associations between parents' social attributes and the nutritional status of children (Agnarsson *et al*., 2001; Ojofeitimi *et al*., 2003). For children below five years of age, younger mothers tend to make better decisions on their children's feeding needs and the choice of diets, compared to older mothers (McKeever & Miller, 2004; Thairu *et al*., 2005). A mother's demographic, economic, and social characteristics execute a vital responsibility in ascertaining a child's nutritional level. Also, mothers' employment status and educational attainment tend to vary with the quality of nutrition of their children. Mothers with high educational attainment have an increased likelihood of ascertaining the quality of nutritional knowledge to feed their child the right way wand with all the required nutrients (Duflo, 2012).

Women's control of resources has also been found to improve child nutrition status significantly. Behrman & Skoufias (2006) examined the effect of the PROGRESA programme that gave money to mothers based on whether they were monitoring the dietary supplementation and healthcare of their school-going children. Increased maternal control of household resources improved child nutritional status and boosted health and education. This is because mothers allocate an increased proportion of such resources towards the welfare enhancement of their children. In Bangladesh, Quisumbing & De La Brière (2000) also found that wives with increased control over resources tend to increase children's welfare.

Smith *et al*. (2003) studied the association between child anthropometric indices and maternal status (defined as women's power relative to men in the society) in 36 underdeveloped countries from Sub-Saharan Africa, Latin America and the Caribbean and South Asia using the Demographic Health Survey data spanning 1990 to 1998. The two measures of women's status used were women's decision-making participation (measured by an index that was computed from 1. whether the woman works and earns cash income, 2. the woman's age at first marriage, 3. the difference in the man's and woman's age, and 4. the difference in the man's and her woman's years of education) and the degree of equality between men and women at the community level (measured by an index constituted by 1. the difference in age-adjusted vaccination recorded for boys and girls under five, 2. the difference in age-adjusted weight-for-age Z-scores recorded for boys and girls under five years, and 3. the difference in years of schooling for adult men and women). They found evidence of a positive effect of maternal decision-making power on both short-term and long-term child nutritional status, although the impact varied across regions.

Shroff *et al*. (2009) examined the effect of maternal autonomy on child stunting (for children under 36 months) in India, using the National Family Health Survey (NFHS) data. Women who could go to the market or visit family and friends without permission had a significantly

lower likelihood of having a stunted child. This result was attributable to avenues a woman gets to exchange information that may help to improve the quality of care, feeding or nutrition. The possibility of being denied permission to visit family members or go to the market limits a woman's chances to interact meaningfully with others.

Carlson *et al*. (2015) examined the association between women's autonomy and child nutritional status (low birth weight) using India's 2005–2006 National Health and Family Survey (NFHS 3) and a maternal autonomy score that was categorized as high, medium, and low. After controlling for socioeconomic covariates, the results indicated that high levels of maternal autonomy adequately predict favourable birth weight, while low levels of autonomy lead to low birth weight. The authors explained that women with low levels of autonomy were likely to have poor nutritional status and were, thus, at a higher risk of delivering children with low birth weight.

Studies examining the link between women's empowerment and children's nutritional level have noted that the association is positive. Bhagowalia *et al*. (2012), using logistic regression and 2007 DHS data from Bangladesh, found a positive association between women's empowerment and better long-term child nutritional status. They found that violence increases stunting and mobility among children, as decision-making participation improves dietary diversity. Other variables such as maternal height and education were also reported to reduce the probability of stunting. Malapit and Quisumbing (2015) examined the association between women's empowerment and children's nutritional status empowerment in agriculture using northern Ghana's feed the future population-based survey data. Using OLS, they found a stronger positive association between women's empowerment and the feeding practices (exclusive breastfeeding) and a dietary diversity score for infants and young children, as opposed to the weaker association with the nutritional status of adults.

Using the Ghana DHS data, Nuhu (2016) examined how the bargaining power possessed by a mother affects the health status of her children in Ghana. The OLS and 2SLS results suggested a positive association between child health status (BMI of the child) and mother's bargaining power (proxied by her decision-making participation). Also, in Northern Ghana is a study done by Zereyesus *et al.* (2017), which assessed the association between women's empowerment (Women's empowerment in Agricultural Index) and child health status (weight-for-height and height-for-age z-scores) in Northern Ghana. They employed the Feed the Future Survey data and Multiple Indicators Multiple Causes model (MIMIC) and sampled 2,405 women. The results showed no significant association between women's empowerment and children's health status. However, this study did not control for covariates such as the age and working status of partners, health insurance registration, type of toilet facility used and also did not account for the possibility of a reverse causality between women's empowerment and child health.

Izraelov and Silber (2019) opined that decisions made by women in terms of the nutrition of family members depend on their empowerment status. They used the 2008 Ghana DHS data to create a multidimensional approach to measuring empowerment (resource and information availability, attitude towards violence by husband and ability to make decisions) and defined child health by height-for-age and weight-for-age. Using the MIMIC approach, they found a positive impact on the decision-making ability of women. On the contrary, resource and information availability and attitude towards violence by husband had no significant impact on child health.

Abekah-Nkrumah & Lawson (2020) examined the effect of women's empowerment on the nutritional status of children in SSA using DHS data. Women's economic power (economic empowerment) and the agency afforded to women due to existing social norms (social

empowerment) were considered using indices[7] that were computed from PCA procedures. Also, the author computed a composite empowerment index from the resource access index to measure overall women's empowerment. With the aid of quantile regression and ordinary least squares (OLS) regression, the study showed that both the social norms and access to resources are essential for the health status of children. However, the quantiles (10%, 25%, 50%, 75% and 90%) used were arbitral. Some authors opine that using quantiles that mirror the exact nutritional groups may be preferable to arbitral quantiles and may lead to more policy-friendly conclusions (Essilfie *et al*., 2020; Rodgers & Kassens, 2018).

Essilfie *et al*. (2020) examined the effect of women's empowerment (measured by a woman's education attainment relative to her partner, domestic violence and decision-making) on the nutritional status of children in Ghana. Using the Ghana DHS data, OLS regression and quantile regression techniques, the authors found that women's empowerment is positively related to the improved long-term nutritional status of undernourished children under age five.

2.2.3.1 Conclusion

The economics literature on the relationship between women's empowerment and the educational outcomes of their children has primarily focused on the investment emanating from women's employment decisions (Hoffman, 1980; Muller, 1995; James-Burdumy, 2005; Schildberg-Hoerisch, 2011; Ermisch & Francesconi, 2013) and ownership of assets (Calero *et al*., 2009; Kim and Sherraden, 2011; Nam & Huang, 2009; Quisumbing, 2003; Shimamoto & Gipson, 2017). Notably, little attention is given to how social norms, beliefs, and practices may affect women's bargaining power. The few studies that examined how dimensions of

[7] The social norms index was computed using an unweighted average of sub-indices that were computed with PCA to aggregate responses to questions that bothered on themes such as the decision-making power, autonomy, social preferences and the perception of violence by women. The women's economic power index is the first principal component of the difference in years of schooling, whether a woman was currently working and the type of earnings

social norms affect education looked at the enrolment rate of the wards (Gebremedhin & Mohanty, 2016; Luz & Agadjanian, 2015). Thus, such analyses do not adequately elucidate the effect of women's empowerment on their wards' quality of learning. This study considers whether and how maternal resource access and social norms may affect the quality of learning attained by their wards by looking at the effect on cognitive test scores and academic test scores.

The discussions on children's cognitive development and academic performance have also been limited to the early years of life, even though mother-child interaction does not necessarily pertain to only the early years of life. Indeed, a good part of the formation of children's cognitive abilities occurs during a child's early years. However, the development of such abilities may be affected by the level of investment in the child's education or learning and the quality of maternal interaction with the child. The Ghana Socioeconomic Panel Survey (GSEPS) data administered the digit-span test to children and adolescents (5 to 15 years old). Also, mathematics and English language tests were administered to children, adolescents and young adults (9 to 26 years old). This offers the chance to examine the effect on a wide age range, given that cognitive development is a lifelong process.

The studies reviewed so far have mainly used DHS data to examine how diverse forms of women's empowerment affect children's nutritional statuses. Most of them have focused on undernutrition, where the outcomes of concern are whether a child is stunted, wasted or underweight. However, over nutrition is on an upward trend globally, and Ghana is not immune to its effects. Also, a majority of existing studies have, by measuring child nutrition and per the estimation methods used, implicitly assumed that empowerment affects both the over-nourished, normal and undernourished child equally. This may, however, not be the case in reality. The present study uses appropriate econometric techniques to present different estimates of women's empowerment on the nutrition or health status of children under age

five at different points of the nutrition distribution with the help of the GSEPS data. The implied advantage is that the effect of women's empowerment for undernourished and over nourished children is discussed in the present analysis using the GSEPS data.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the methods used to answer the research questions. The first sub-section of the chapter presents the methods used to assess the effect of women's political empowerment on welfare or economic development. The next sub-section discusses the methods used to examine the effect of women's empowerment on wards' cognitive development and academic achievement in Ghana. This is followed by the last sub-section that shows the methods used to examine the relationship between women's empowerment and the nutritional status of children. Each sub-section details the empirical model, a description of variables used, data sources and methods of analysis.

3.2 Methods used to examine the effect of women's political empowerment on welfare

3.2.1 Empirical model specification

This study uses an unbalanced panel dataset comprising 38 African countries from 1990 to 2017. The study adapts to the 2SLS-FE model used by Haile & Niño-Zarazúa (2018) to examine the effect of government spending on aggregate welfare:

$$W_{it} = \beta_1 Y_{it} + \beta_2 S_{it} + \beta_3 I_{it} + \beta_4 D_{it} + \gamma X + \eta_i + \nu_t + e_{it} \qquad (3)$$

where aggregate welfare (W) is expressed as a function of real GDP per capita (Y), government's social spending (S), institutional quality (I), level of democratization (D), other control variables that affect welfare (vector X), country-specific effects or time-invariant effects (η) and time dummies (ν). To estimate the effect of women's political empowerment on welfare, the model is modified and estimated as follows:

$$W_{it} = \delta_0 + \delta_1 P_{it} + \delta_2 Z_{it} + \eta_i + \nu_t + \varepsilon_{it} \quad (4)$$

where $\delta_0, \delta_1, \delta_2$ are constants; W_{it} represents the welfare measures; P_{it} is the women's political empowerment index; Z_{it} is a vector of control variables (economic growth, government spending (percentage of GDP), the degree of urbanization, access to improved water, access to improved sanitation, age-dependency ratio, quality of governance, democracy, political instability (proxied by the number of successful coups d'états), income inequality (Gini coefficient), the degree of openness and inflation rate) and ε_{it} is the error term. ***i*** is country subscript and ***t*** is time subscript. η_i captures the unobserved country-specific effects which are also time-invariant, while ν_t are time dummies.

3.2.2 Description of variables

Dependent variables

Welfare measures

For this study, two welfare measures are used, namely, an index of the non-income components of welfare[8] and household income are employed as the dependent variables. The household income data is obtained from the World Bank (2020) PovcalNet database. The data is obtained from national surveys for different years and across countries. As such, the data is not regular, and the panel derived is highly unbalanced. Thus, considerable modifications are needed to get reasonably reliable estimates for the time series (Chen & Ravallion, 2010). The World Bank accordingly revises the data. As such, it has implications for comparability over time.

The non-income welfare index (accepted by the UNDP (2015)) is computed from a fixed reference point in time (1990). Although it is similar to the HDI, there are conceptual differences in its computation, bearing in mind the objective of overcoming some criticisms

[8] The non-income elements of the HDI are the Life Expectancy Index and the Education Index.

levelled against the HDI. Ravallion (1997) argues that due to the high correlation among the HDI components and between them and the HDI, a pure economic variable such as GDP alone may suffice for a discussion of HD. Ogwang (1994) noted that the life expectancy index is the most critical predictor of the HDI. This affirms that the life expectancy index could instead be a simplified form of the HDI, giving credence to how vital the non-income components of the HDI are in welfare analysis.

The HDI has been criticized as a measure that cannot be compared over time due to changes in its computation and the lack of a fixed reference point, resulting in a distorted time series (Morris, 1993). McGillivray (1991) also argued that the HDI measures relative development, and as a result, a country's score can change even when there are no absolute improvements in the components of the HDI. Other studies also draw attention to the use of equal weights for the elements of the HDI. Fosu (2002) justifies equal weighting by arguing that appropriate weights would depend on adequate knowledge of the social welfare functions that pertain to each country; since these functions are unknown, equal weights are the most appropriate "second best" solution. The non-income measure of welfare created for this study provides a way around the criticisms levelled by McGillivray (1991) and Morris (1993). Specifically, the study follows the normalizing method of the United Nations (2015) and define HD as

$$\text{HD} = 0.5LE + 0.5ED \tag{5}$$

where LE_i is the life expectancy index defined as

$$LE_i = \frac{(LE_i - LE_{\min})}{(LE_{\max} - LE_{\min})} \tag{6}$$

and ED_i is education index defined

$$ED_i = \frac{MYED_i + EYED_i}{2} \tag{7}$$

with $MYED_i$ and $EYED_i$ respectively given by

$$MYED_i = \frac{(MYED_i - MYED_{\min})}{(MYED_{\max} - MYED_{\min})} \text{ and } EYED_i = \frac{(EYED_i - EYED_{\min})}{(EYED_{\max} - EYED_{\min})} \quad (8)$$

where, $LE_{\min}$ and $LE_{\max}$ are the minimum and maximum values of life expectancy in 1990 among African countries, respectively. Similarly, $MYED_{\min}$ ($EYED_{\min}$) and $MYED_{\max}$ ($EYED_{\max}$) are the minimum and maximum values of mean years of education (expected years of education) in 1990 among African countries. This variable was constructed for 38 countries for which data was available. HD scores for 1990 range from 0.0901 (for Rwanda) to 0.6502 (for Libya) and 0.3501 (for Central African Republic) to 0.8542 (for Mauritius) in 2017 (See APPENDIX A for more details).

Independent Variables

Women's political empowerment

Women's Political Empowerment Index is a variable from the VDEM dataset (Coppedge *et al*., 2018). Each country's annual score of women's political empowerment is obtained from principal components of VDEM's women's civil society participation index, women's civil liberties index, and women's political participation index. Ranging from 0 to 1, a higher score represents greater women's political empowerment status within a nation. This data is specifically selected to measure women's political empowerment within a country because it takes into account not only the number of women in political positions (both legislative and executive) in each nation but also the fundamental civil liberties of women and the participation of women in civil society organizations in a nation. When women attain higher status or increased political empowerment, they are able to exercise more significant influence on social policy as they tend to lobby for increased investment in education,

healthcare, nutrition and other social interventions that enhance welfare[9] (Boehmer & Williamson, 1996; Koenen *et al*., 2006). It is expected that women's political empowerment would have a positive effect on welfare.

The measure of economic growth

The annual growth rate of GDP is a good measure of economic growth. However, the growth rate of GDP is likely to be highly correlated with the political empowerment measure. Economic growth may also depend on the welfare statuses of individuals in a reverse manner, leading to potential endogeneity (Ranis *et al*., 2000)[10]. Following Fosu (2002), the predicted values of the growth rate of GDP are used in the estimations. The predicted values of GDP growth over the period 1990-2017 are based on the augmented production function; The labour force (growth rate of the labour force), investment (total investment as a proportion of GDP), exports (exports of goods and services as a percentage of GDP) and a constant were used as instruments[11]. The arguments of the production function are assumed to affect HD through GDP. Hence, the use of predicted values of economic growth derived from the augmented production function would help rid economic growth of any impact from HD scores. It must be mentioned that the predicted values of the growth rate of GDP is included in only the model with the non-income HD as the dependent variable. This is because including it in the model with household income as the dependent variable would likely create endogeneity.

Urbanization

Urbanization can be defined as the percentage of a nation's population living in cities with not less than 20,000 dwellers (Njoh, 2003). It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects and

[9] The statement does not mean that without political power, women have no influence at all. It means that political power becomes a vector for women to effectively influence social policy

[10] See tests for endogeneity in APPENDIX D (Table D2) where the null of exogeneity is rejected.

[11] Following Fosu (1990), export growth is deemed an essential input into economic development in African countries. This prompted the use of an augmented production function with the export to GDP as an instrument.

obtained from the WDI dataset. Freedman *et al*. (1978) explained that urbanization is associated with a complex division of labour, a high level of physical mobility, a relatively high level of secularism and a decline in the influence of the traditional family. All of these contribute to social collapse and weaken family structures, thus rendering the execution of important socio-economic roles impossible and negatively affecting development (Freedman *et al*., 1978). On the contrary, many studies provide insights into the pros of urbanization. For instance, urbanized areas are associated with sanitary conditions, access to improved water, and lower mortality rates (Polèse & Stren, 2000) and improved health (Atkinson *et al*., 2016; Njoh, 2003; Schultz, 1993). More so, urban centres with good infrastructure attract foreign investment. So, there is the likelihood for state policies on education, health and infrastructure to be biased towards the urban centres. Therefore, living in urban areas increases one's likelihood of having relatively better living standards and good health (Bradshaw & Noonan, 1997).

Quality of governance

Governance has become an important factor over the last two decades, and it is a critical component for sustained economic growth and aggregate welfare (Ahmad & Saleem, 2014). Therefore, good quality governance has been recognized as an enviable feat to promote well-being, hence its inclusion in the SDGs (SDG 16). If countries want better growth and welfare, then good reforms of governance are needed. Evidence is provided that elements of quality governance such as regulatory quality, control of corruption, political stability, and government effectiveness significantly affect welfare (Ahmad & Saleem, 2014; Keser & Gökmen, 2018; Nandha & Smyth, 2013). According to Nandha & Smyth (2013), countries can increase welfare levels by making governance systems more productive and increasing investment in diverse aspects of welfare. The quality of governance variable is measured by the mean value of the International Country Risk Guide dataset (ICRG) variables

"Corruption", "Law and Order", and "Bureaucracy Quality". It ranges from 0 to 1, where higher values indicate higher quality of government. Other indicators of governance such as democratic accountability, ethnic tensions and democracy index are added to the estimations to examine the robustness of the results.

Income inequality

Several studies suggest a significant negative relationship between welfare and income inequality. For instance, Mikk (2008) compared the Gini index between other countries and the Baltic States and found a robust negative association between the HDI and income inequality with a sample size of 129 nations. As aligned with Asafu-adjaye (2004), Mikk (2008) noted that income inequality has a positive association with poor health. Wilkinson & Pickett (2009) showed, by reviewing 168 peer-reviewed papers, that about 70 of such works support a strong negative relationship between income inequality and population health status. As an indicator of inequality, the Gini index[12] measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. The scale is from 0 to 100, where 0 represents perfect equality and 100 implies perfect inequality and is sourced from the WIID.

Government expenditure

Public (health and education) expenditure is an effective input for HD attainment (Haile & Niño-Zarazúa, 2018; Iheoma, 2014; Rajkumar & Swaroop, 2008; Zahari & Sudirman, 2017). However, studies such as Filmer & Pritchett (1999), Harbison & Hanushek (1992) and Mingat & Tan (1998) revealed that the association is fragile. This is mainly due to institutional deficiencies, as found in many developing countries. Government expenditure is measured using the sum of public health expenditure as a percentage of GDP (from WHO) and government's education expenditure as a percentage of GDP (from WDI).

[12] The Gini coefficient has many missing observations and is the main limitation on the sample size (see Table 4.1)

Access to improved water

Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources such as public taps or standpipes, tube wells or boreholes, protected dug wells and protected springs (World Health Organization/UNICEF., 2012). Having access to improved water leads to reduced mortality rates and better health in general (Bradshaw & Noonan, 1997; Polèse & Stren, 2000). Data on improved water is obtained from the WDI database.

Access to improved sanitation

Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to a piped sewer system, pit latrine, septic tank), ventilated improved pit (VIP) latrine, composting toilet, and pit latrine with slab (Ritchie & Roser, 2019). Having access to sanitation results in reduced mortality rates and better health in general and is linked to improved livelihood (Bradshaw & Noonan, 1997; Polèse & Stren, 2000). Data on access to improved sanitation is sourced from the WDI database.

Age-dependency ratio

The age dependency ratio is measured as the ratio of the non-working population (children below age 15 and the aged (above 64)) to the working-age population (age 16 to 64). The higher the age-dependency ratio, the lower the labour force participation. This affects the tax base and the government's ability to raise enough revenues to fund social services that enhance the welfare of individuals (Hasan & Waheed, 2021).

Political instability

Political instability is proxied by the number of successful coup d'états. Fosu (2002) revealed that elite political instability reduces the rate at which growth is transferred into improvement in HD; this happens because the quest for leaders to stay in power drives them to channel resources to the weighty political elite (who can help them remain in power) and away from HD-enhancing spending. The data is obtained from the Centre for Systemic Peace (CSP).

Democracy index

The democracy index is obtained from the Freedom House/Polity. It ranges from 0 to 10, where 0 is least democratic and 10 most democratic. One popular explanation is that democracy enhances welfare as it serves as a mechanism for redistribution and keeping governments accountable and responsible (Brown & Mobarak, 2009; Fallon *et al*., 2012; Lake & Baum, 2001). However, several recent studies have contested the positive correlation between the type of regime and welfare (Acemoglu *et al*., 2008; Ross, 2006). There is ample real-world evidence supporting this claim as more authoritarian regimes have experienced noticeable improvements in human development, with notable examples being the East Asian non-communist countries (Gerring *et al*., 2012). At the same time, some democratic countries such as many Latin American countries and India appear to have experienced persistent wealth disparities and a high level of poverty (Saha & Zhang, 2017).

Openness

Openness is the sum of exports and imports of goods and services as a percentage of GDP. Openness influences development mainly through the import of physical and human capital, technology and new ideas that could boost a country's development capacity (Mustafa *et al*., 2017; Nourzad & Powell, 2003). For instance, openness may allow better-trained medical staff and improved medical equipment imported from advanced countries. This may

ultimately improve population health and therefore contribute to human development. Similarly, imports of modern equipment, technical services, and modern methods of production may expand a nation's productive capacity, leading to higher earnings. Openness to the exchange of students and scholars may also enhance the quality of education. Data on total exports and total imports are obtained from the WDI.

Inflation rate

Inflation is the rate at which prices increase over a period of time. Inflation affects the real value of earnings and increases the cost of living. Also, the reduced demand levels resulting from persistent and appreciable price increments affect business profitability and the ability to expand and employ more people. The net effect of very high inflation is a reduction in welfare levels (Feldstein, 1997). The data on inflation is obtained from the WDI.

3.2.3 Sources of data

For this empirical analysis, data is sought from the databases of World Development Indicators (WDI), World Bank Governance Indicators (WBGI), World Income Inequality Database (WIID), Centre for Systemic Peace (CSP), Varieties of Democracy (VDEM) and Quality of Governance (QoG) indicators standard dataset. The sample period for the analysis ranges from 1990 to 2017.

3.2.4 Methods of analysis

As a main method of analysis, the study estimates the effect of women's political empowerment using the two-stage least square fixed effect (2SLS-FE) estimation technique. Initial tests show that there is heterogeneity (country-specific effects) among the panels. Therefore, random effect estimation is preferable to a pooled OLS estimation (see Breusch and Pagan Lagrangian multiplier test for random effects in APPENDIX B1). Further tests show that the country-specific effects are strongly correlated with the regressors in the main

model. The F test is highly significant, and the interclass correlation coefficient (rho) show that about 96 percent of the variation was due to differences across the panels. Indeed, a Hausman test is conducted using the main model and the results point to the rejection of the null of no systematic difference between the fixed effect and random effect estimations (see APPENDIX B1). Hence, fixed effect is adjudged preferable to random effect estimation. A generalized Method of Moments (GMM) estimation could have been a solution to the challenge of heterogeneity. However, this method removes the country-fixed effects through differencing and invokes a high degree of homogeneity (Arellano & Bond, 1991). Thus, in a heterogeneous panel, GMM may lead to inconsistent estimates as a huge proportion of variation in the model is explained by the country-specific effects.

A fixed-effects estimation is deemed preferable because it allows for correlation between the regressors and the country-specific effects. It avoids the restrictive assumption that the country-specific effects are uncorrelated with the regressors as in a generalized least squares (random effect) estimation. Thus, it brings out the true effect between the dependent and independent variables. However, the fixed effect estimation presumes, inter alia, that women's empowerment is exogenously determined, which is an unreasonable assumption given the possibility of reverse causality between women's political empowerment and the level of welfare which cannot be overlooked. Indeed, the Durbin and Wu-Hausman tests for the endogeneity saw the rejection of the null hypothesis that the empowerment measure is exogenous (see APPENDIX D (Table D2)). A 2SLS estimation could offer a solution to this potential endogeneity. It is, albeit, less preferable to a 2SLS-FE method of estimation which provides the added advantage of accounting for country-fixed effects. The 2SLS-FE is considered the most appropriate estimation method in the present case, given the heterogeneous nature of the data and its instrumentation process.

Ardent attempts to intuitively find a reliable instrument resulted in the selection of two variables, namely, "legal origin" and "property rights to women lagged by a period". In the 2SLS-FE estimations, the ratio of property rights to women lagged by a period to the legal origin is used as an instrument, the justification for which is provided hereafter. African countries at the time of independence generally assumed their colonists' legal system. Countries that were colonised by the British assumed the common law system, and those that were colonized by European countries (Spain, Italy, France, Portugal, or Belgium) adopted civil codes of law. The literature has demonstrated that significant differences exist between common law and civil law nations' legal outcomes (Anderson, 2018; La Porta *et al*., 2008). Specifically, civil law countries demonstrate less secure property rights as compared to common law nations. Common law is colligated with the lesser formalism of judicial processes and higher judicial independence relative to civil law. Common law is, therefore, strongly linked with better contract enforcement and more secure property rights.

Perhaps in the African context, marital property laws are essential for women and their bargaining power within households. These vary significantly between common and civil law; the differences are mainly embedded in how both laws treat the household. The traditional common law denies a married woman practically all legal rights. She could not own or manage her own property, administer or manage a business undertaking, be a party to a contract, or get any remuneration for her labour. Husbands were the exclusive proprietors of marital property. In 1882, the "Married Women's Property Act"[13] instituted a system of distinguished marital property (separate from men), and permitted married women to own and manage their own property. This Act has been the model for many African countries regarding the rights of women (Anderson, 1999; Buregeya *et al*., 2001).

[13] The Married Women's Property Act of the United Kingdom Parliament greatly changed English law regarding married women's property rights. It allowed married women to control and own properties in their own right.

However, the establishment of distinct marital property offered women no protection upon the dissolution of marital union (either by death or divorce). In particular, housewives (or those on the family farm), without being recipients of independent income, had no rights to any marital property upon dissolution. This is starkly contrasted to the marital property system that exists under civil law. Marital property systems under civil law recognize joint ownership of all property during the marriage and, upon marital dissolution, gives complete protection to wives (all marital property is shared equally). This regime impliedly admits the value of non-pecuniary contributions such as childbearing, subsistence agriculture, care and household chores to the household, without asking for evidence of contribution from either spouse.

In the 1960s (the period when most African nations gained independence), there were discussions and reviews of the common and civil laws in most colonist nations. These discussions and changes were, however, not mirrored on the African continent. According to Htun & Weldon (2011), no significant alterations or reforms to marital property law have since occurred. Hallward-Driemeier *et al.* (2012) confirm that all countries with civil law origin still have community marital property. Contrariwise, common law countries have retained their separate marital property law.

Legal origin is coded 0 for civil law and 1 for common law, implying that higher values of legal origin would be associated with low levels of empowerment. The legal origin cannot be used as a standalone instrument in the 2SLS-FE estimation since it is time-invariant. The use of property rights to women is considered; however, it is significantly correlated with HD scores (correlation coefficient=0.23). Lagging property rights to women by a period, its correlation with HD is reduced to 0.13. Therefore, the ratio of the lag of property rights to women to the legal origin is used as an instrument for women's empowerment. The expectation is that the ratio increases as empowerment increases. Indeed, women's political

empowerment is highly and significantly correlated with the instrument (correlation coefficient=0.46) at a 1 per cent significance level. The Kleibergen-Paap F weak identification test is conducted to attest to the suitability of the instrument in all estimations. The F statistics are above the conventional level of 10.

The main set of estimations are presented in Table 4.2 (dependent variable is the non-income HD measure) and Table 4.3 (dependent variable is household income). In contrast, Table 4.4 and Table 4.5 show some robustness checks. Multiple estimations are done in each table to facilitate the comparison of results (to check for consistency) using different methods. Tables 4.2 and 4.3 show three separate estimations; the first model shows findings from 2SLS estimation while the second model shows fixed-effect estimates. The third model presents 2SLS-FE estimates. It is noteworthy that the Gini index has a lot of missing observations and although it is a key variable in equation (4), its inclusion comes at a cost of losing observations (about two-thirds of the total observations) and degrees of freedom.

General dominance statistics are computed to examine the extent of the influence of women's empowerment on welfare. The statistics are computed as a weighted average additive contribution to the overall goodness-of-fit statistic that an independent variable makes across in a model in which the independent variable is included. If an independent variable *(X)* has a bigger general dominance statistic than another independent variable *(Y)*, then *X* "generally dominates" *Y*.

3.3 Methods used to assess the effect of women's economic and social empowerment on the cognitive development and academic achievement of their wards in Ghana

3.3.1 Empirical model specification

Adopting the model used by Khanam and Nghiem (2016), the study proposes a model of child cognitive development outcome that combines the investment theory of child development (investment in materials, home environment and essential services) and family

stress perspective (emphasizing how stress and mental health of mothers influence their parenting style or practice). This model provides insights into why mothers' empowerment, education, stress and household conditions might influence their wards' cognitive development and academic achievement. On the one hand, investment theory explains that child development results from parental investment in both time input and material resources. Economically empowered mothers can help purchase higher quality resources such as improved housing, better school, good food, good books, reputable childcare, all of which can spur their children's cognitive development.

However, depending on the wage rate, level of education and health, mothers may have different time preferences. High wages or earnings may imply more work hours and, thus, less time for the mother to interact with the child due to the high value of money (Khanam & Nghiem, 2016). On the other hand, social norms may suppress a mother's ability to influence her children's quality of learning. When a woman is precluded from being part of household decision-making processes, her bargaining power and ability to make valuable inputs into the welfare of her wards may be reduced.

Free family contact and mobility of a mother are aspects of social empowerment which may enhance the quality of learning of her children or wards. The mobility of a woman can enhance her ability to work, aspire for higher positions or move to different territories that may be more profitable. Also, contact with family members can be a source of cultural and intellectual capital as family members could expressly and tacitly teach the children attributes such as perseverance, hard work and teamwork. These attributes can help the wards to develop attitudes that can enhance their academic achievement. Furthermore, restrictions to movements and family associations may deny women from recreational facilities that may reduce mothers' stress and may, thus, affect the rate and quality of mother-child interaction. Given how essential such interaction is to cognitive development, empowerment levels may

be crucial for the cognitive development of wards. This model explains how and by how much economic empowerment and social empowerment of women matter for their wards' cognitive development and academic achievement in Ghana. The empirical model to be estimated is specified as follows:

$$Y_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 X_{it} + \beta_3 P_{it} + \beta_4 H_{it} + \varepsilon_{it} \quad (9)$$

where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are constants; Y denotes cognitive test scores using the digit span test, mathematics scores and English language scores; E denotes the measures of empowerment, namely economic empowerment and social empowerment (used in separate specifications due to the possibility of a high correlation between both measures of empowerment); X is a vector of characteristics of children such as gender, age, years of schooling, nutritional status, public school and access to textbooks; P is a vector of the characteristics of mother and father such as mother's age, mother's education, mother's height, father's age, father's education, father's number of work hours, father's height; H is a vector of household characteristics such as household's real expenditure quintile, locality and region Since the sample for the empowerment variables includes only married women or women in cohabitation, a Heckman correction procedure is executed in all estimations to deal with possible selection bias.

3.3.2 Description of variables

The dependent variables employed are test scores from three cognitive tests, namely, the digit-span test, mathematics test and English reading test. The main independent variables include the measure of women's economic empowerment index and women's social empowerment index. Other covariates are also discussed.

Digit span test

A digit-span test is used to assess working memory or storage capacity for numbers. Participants hear or see a sequence of numerical digits and are tasked to reproduce the sequence correctly. The level of difficulty increases (using increasingly longer sequences) in each trial to ascertain the limitations of working memory. The higher the number of sequential digits that a participant can accurately remember, the higher the score. Digit-span tasks are also given backwards or forwards, such that the participant is asked to either recall the sequence in a reversed or regular order. Performance on a digit-span task cannot be affected by semantics, frequency of appearance in daily life and complexity, making it relatively more objective (Jones & Macken, 2015). It is expected that children and young adults whose mothers are empowered are more likely to score higher on cognitive tests (Lavy *et al*., 2016). This is because more economically empowered mothers can contribute towards investments in the education of children (Cunha *et al*., 2010; Heckman, Moon, Pinto & Savelyev, 2010; Ramey & Remey, 2009). Also, more socially empowered mothers can easily draw on the existing social capital such as family members that may offer help in times of need. Besides, women's mobility makes it easier for them to work and build meaningful networks while also serving as a source of recreation. Recreation provides avenues for the release of stress and can enhance mothers' psychological health, making them more capable of having quality interactions with their children. Quality mother-child interactions can enhance the cognitive development of children (Tamis-LeMonda *et al*., 2004). This variable is scaled from responses to both the forward and backwards digit-span test questions. The questions were administered to all children aged 5 to 15 years. The responses are scaled, ranging from 0 to 100 percent.

Mathematics test

Mathematics test questions were administered to all household members aged from 9 to 26. The questions bordered on arithmetic operations such as addition, subtraction, multiplication and division of two numbers, with the difficulty level progressing as more questions were being answered. As discussed for cognitive development, mothers' empowerment status positively affects their ability to invest in the academic performance of their wards. As such, some studies have found positive a positive relationship between women's empowerment and mathematics test scores. (Cleary, Velardi & Schnaidman, 2017; Dickerson, McIntosh & Valente, 2015; Guiso, Monte, Sapienza & Zingales, 2008). The number of correct responses is converted into percentages, ranging from 0 to 100%.

English language test

English reading test questions were administered to all household members aged from 9 to 26. A short passage is read by respondents, and then questions are posed from the passage. Eight questions were asked, with each having four options to choose a correct answer. The number of correct responses is converted into percentages, ranging from 0 to 100%. Again, a positive relationship is hypothesized as both economic and social empowerment of mothers are expected to improve the language test scores of their children (Lavy *et al*., 2016). This is due to both the increase in investment and improvement in mother-child interaction (Tamis-LeMonda *et al*., 2004; Cunha *et al*., 2010).

Independent Variables

Social empowerment

Following Koenen *et al*. (2006) and Weber & Ahmad (2014), this variable describes the extent to which social norms, beliefs and practices that direct the liberties of physical mobility, family association and other social support systems are made available to a woman

to facilitate her agency. APPENDIX C describes the construction of the social empowerment measure (using PCA) and input variables used. Eleven items or input variables that bother how social norms and beliefs affect women's agency are included in the PCA. After the factor analysis and varimax rotation, two principal components were identified. Within the first principal component, five of the social-empowerment related input variables had factor loadings greater than 0.3, thus, accounting for a significant part of the variation in that principal component.

The five input variables are whether her husband insisted on knowing where she was at all times, whether a woman's husband tried to limit her contact with her family within the past twelve months, whether the mother believes it is better to educate a son than a daughter, whether the man of the house should make family decisions alone and whether a wife should tolerate being beaten to keep her family together. These questions were posed to women in the GSEPS data, and women indicated whether they agree or disagree. The items have dichotomous responses, taking the values 0 for "Agree" and 1 for "Disagree". The predicted scores from the principal component analysis are normalized, such that they range from 0 to 1. This principal component was then called the composite measure of social empowerment. The input variables are also used in the estimations to tease out their individual effects on the cognitive development and the academic achievement of wards.

It is hypothesized that more socially empowered mothers can benefit from reduced mobility restrictions. This can enhance their ability to work and join meaningful networks that will afford them other opportunities to engage in economic activities and earn higher incomes (Weber & Ahmad, 2014). As such, more resources become available to the household for investment into the education of their wards. Again, as noted by Hunt & Kasynathan (2001), domestic decision-making is a measure of social empowerment, serving as a vehicle to enable the fulfilment of mothers' preferences for increased investment in the health and education of

children. Families may serve as a source of financial support and a vector for the transmission of valuable culture that may foster the development of a good attitude towards work and interpersonal relations. Contact with family enables the sharing of ideas and serves as a place of comfort and solace in difficult moments. Contact with family may, thus, reduce the stress of mothers in hard times and transmit enviable traits that may enhance learning (Lucifora & Meurs, 2012). Also, when women approve of being physically abused to keep their family together, it shows the extent to which they lack the power to challenge social norms and culture that are inimical to their wellbeing (Kishor, 2000; Malhotra *et al*., 2002). Furthermore, the belief that male children must be educated instead of female children indicates that society and the informal institutions therein are formulated to favour males. In such societies, females may generally struggle to get equitable access to other basic resources to make life comfortable (Heilman, 2001).

Economic empowerment

This is a composite variable that was extracted from the PCA procedure as the second principal component. Five input variables that capture a woman's direct access to resources were included in the PCA procedure. They include (1) the response to whether or not a woman a woman's husband did not trust her with money (coded 0 for "Agree" and 1 for "Disagree"), (2) whether a woman is employed (coded 0 for "Unemployed" and 1 for "Employed"), (3) whether a woman can borrow or not (coded 0 for "No" and 1 for "Yes"), (4) whether a woman has any savings or not (coded 0 for "No" and 1 for "Yes") and (5) land ownership (coded 0 for "No" and 1 for "Yes"). Four out of five of the input variables which accounted for a significant portion of the variation in the second principal component are whether the woman is employed, whether the woman can save, whether the woman can borrow and whether the woman owns at least a piece of land. The predicted scores from the PCA are normalized to the 0 to 1 range.

It is expected that when women have access to land, credit, savings, a source of employment and the autonomy to spend their earnings, it will enhance their bargaining power, leading to an increase in the share of household resources that are invested in the health and education of the children (Glewwe, 1999b; Strauss, 1990). However, an increase in the wage rate might change the value of her time and increase the opportunity cost of parent-child interaction. Suppose a mother decides to increase her hours of labour supply. In that case, it reduces parental interaction with the child, and the net effect on child cognitive development may not be determined a priori.

Gender of ward

This variable is a dummy variable that captures whether the ward is a female or not. It is coded 1 for "Female" and 0 for "Male". The effect of gender on the ward may either be positive or negative.

Age of ward

Age is a continuous variable capturing the age of the child in years. This variable is employed to assess how age affects the child's test scores. The effect of age is expected to be positive since one would expect older wards to excel at comprehension and recall.

Education

Education is a continuous variable capturing the number of years the child has spent in school at the time of the survey. Early education may provide the skills, knowledge, and interest to pursue intellectual challenges across the life course (Tucker-Drob, Johnson & Jones, 2009). More so, cognition in adulthood may reflect consistent engagement with cognitively complex activities and environments (Parisi, Rebok, Xue, Fried, Seeman, Gruenewald, Frick & Carlson, 2012). Children with more years of schooling (higher education) are more likely to be intellectually equipped and expected to score higher on cognitive tests. Hence increased years of education is expected to be positively related to cognitive scores.

Religion

The religious affiliation of one's family plays a role in the quality of learning one experiences. The three predominant religions in Ghana are Christianity, Islam and traditional worship. Many families are moulded by their religious beliefs, which also affect their relationships, attitudes towards life and essential aspects of life such as education (Hellum, 2007). Religion has contributed to education in Ghana. Denominations under the Christian faith have, as a way of grooming their children, championed the establishment of educational facilities in many parts of the country. The Islam faith has also set up quality schools that members of the faith largely patronise. These are ardent attempts to teach the pupils or students valuable morals such as respect, discipline, teamwork, and tolerance and solidify their understanding of their religious principles. However, religion may adversely affect the academic performance and cognitive development of students. According to Avotri, Owusu-Darko, Eghan & Ocansey (1999), most children in Muslim communities attend Koranic school alongside formal education. These students may be required to go for Koranic lessons before going to school and may be expected to continue their lessons after formal school has ended if they fail to perform well at the Koranic school. Pupils, therefore, spend the greater part of the day between the two types of school. Some churches have also introduced many programmes or services that may occupy the students, leaving little time for personal studies. This can adversely affect their academic performance. Religion is categorized as 1 "Christianity", 2 "Islam" and 3 "Traditional religion". The effect of religion is not determined a priori.

BMI status

This is a categorical variable that describes the nutritional status of a ward. To construct this variable, the weight (in kilograms) was divided by the square of the height (in metres), hence, attaining the body mass index (BMI). The BMI is then adjusted for the age and sex of the

ward (for wards below age 18), using the WHO (2007) standard. A categorical variable is then constructed with values from 1 to 4, where 1 is "Underweight", 2 is "Normal weight" 3 is "Overweight" and 4 is "Obese". It is expected that compared to children with normal weight, those who are underweight are likely to have poorer cognitive development. Having too much weight or being obese may also expose the child to certain health risks and attitudes such as timidity (Ickes, 2011; Lanigan, 2011; Lim & An, 2018). However, obesity may be seen in some societies as a sign of good living and prideworthy (Osayomi, 2020). In such societies, obesity may enhance one's confidence and could have positive implications for performance at school. The net effect of BMI status may either be positive or negative.

Public School

The type of school a ward attends can affect the performance of the ward. In Ghana, two main types of schools are private schools and public schools. In Ghana, private schools provide better quality primary education than public schools (Tooley, 2005). The popularity of private schools could be attributed to the notion that they offer a mechanism for social mobility and the falling quality and standards in public schools. The variable public school is a dummy variable with a value 1 if a ward attends public school and 0 if a ward attends private school.

Access to textbooks

This is a categorical variable and is coded 1 for "No textbook", 2 for "Some, but not all", and 3 for "Has all textbooks". Having access to all the required texts at school is likely to improve learning and raise test scores.

Mother's age

The age of a mother is measured in years. Giving birth at a young age may disrupt parents' human capital development and ability to make good earnings (Diaz & Fiel, 2016). Early parenthood also affects the accumulation and transmission of social, economic and cultural

capital (Powell, ., 2006). The loss of economic, social, and cultural resources has been linked with a reduction in offspring's educational attainment (Björklund & Salvanes, 2011) since young parents cannot invest more in their children. A mother's age is expected to be positively associated with the educational attainment of her ward.

Mother's education

The educational level of a mother is believed to influence her knowledge and skills which can lead to an improvement in her health (GDHS Report, 2014). This variable is constructed categorically into 1 for "no education", 2 for "primary", 3 for "secondary", and 4 for "higher". A mother's level of education is expected to be positively associated with test scores. It is also expected that the effect will be greater for mothers with higher education than mothers with lower levels of schooling. This is because learned mothers are more likely to stimulate their children (for instance, by reading to them), provide home environments that are more nurturing or have more access to programs that can improve school readiness and child development, such as preschool (Ermisch & Pronzato, 2010; Schady, 2011).

Height of mother and father

The height of a person or stature premium is positively associated with both cognitive and non-cognitive ability (Schick & Steckel, 2010). The height of a ward's parents is used as a proxy for the innate abilities that need not be intelligence-related. These abilities, although unobserved, can affect their cognitive development and academic achievement. The study, therefore, controls for the height of mothers and fathers. Height is measured in centimetres, and it is continuous. The effect of mother's height and father's height cannot be determined a priori.

Father's age

The age of a father is measured in years. Being a father at a young age may interrupt a father's schooling and earnings. (Diaz & Fiel, 2016). Early parenthood, which interrupts one's education, is often associated with reduced economic, social and cultural capital and has been linked with a reduction in offspring's educational attainment (Björklund & Salvanes, 2011; Powell, Steelman & Carini, 2006). A father's age is expected to be positively associated with the educational attainment of his ward.

Father's education

The educational level of a father is heavily linked to his earnings ability via the accumulation of employable knowledge and skills (GDHS Report, 2014). This variable is constructed categorically into 1 "no education", 2 "primary", 3 "secondary" and 4 "higher". At least, basic education is expected to be positively correlated with test scores, compared to having no education. More so, a more significant effect is expected for fathers who completed higher levels of schooling compared to those with lower levels. Since educated fathers are better placed to earn more than fathers with no education, they are more likely to afford and provide home environments that are more nurturing or have more access to programs that can improve school readiness and child development such as preschool (Ermisch & Pronzato, 2010; Schady, 2011). The quality of a father's contact with his child cannot be downplayed, as it is also essential for a meaningful stimulation of the child's cognitive abilities (Ruhm, 2000).

Father's hours of work

A Father's hours of work is a continuous variable that captures the total number of hours worked by a father within a week. It is computed by multiplying the daily work hours by the number of days worked within a week.

Rural

Locality is essentially the place where a child had been staying six months before the survey. Locality immensely reflects the resources or amenities a person can access. One would readily assume that urban areas have better infrastructures (such as schools and libraries) than rural areas. However, when population density is considered, the impact may be quite ambiguous. This means more pressure on infrastructures (Koop & van Leeuwen, 2017). Indeed, increased pressure on educational amenities and logistics may worsen the learning outcomes of urban dwellers. Rural is a dummy variable that assumes the value 1 if the child lives in a rural area and 0 if the child lives in an urban area. The coefficient of "Rural" can be either positive or negative.

Region

The levels of economic and social endowments in terms of amenities and resources that support quality education differ across the various regions in Ghana. There is evidence of the north-south divide regarding amenity and infrastructural development in Ghana, where the North is relatively more impoverished (Akrofi, Akanbang & Abdallah, 2018; Al-Hassan & Diao, 2007). When a person is born or lives in regions with better socio-cultural and economic environments and circumstances that support quality education, that person is more likely to attain higher education and have a better quality of learning. Region is categorized as 1 "Western region", 2 "Central region", 3 "Greater Accra region", 4 "Volta region", 5 "Eastern region", 6 "Ashanti region", 7 "Brong Ahafo region", 8 "Northern region", 9 "Upper east region", and 10 "Upper West region". The reference category is the Greater Accra region, and the expected sign of the coefficients can be either positive or negative.

Household Size

Household size is the number of people living in a housing unit. The variable is measured as continuous. It is expected that households with more individuals, especially when there are

many dependents, would experience increased pressure on disposable income and other household facilities (Ahmed, Cruz, Quillin & Schellekens, 2016; Hadley, Belachew, Lindstrom & Tessema, 2011). This may reduce the funds available for investment in the learning materials of wards. Alternatively, large-sized households may also have more working members and a higher supply of labour on household farms. Thus, more earnings may be available to finance learning expenses and improve wards' cognitive and academic achievement outcomes. The sign of the household size's coefficient can, thus, be either negative or positive.

Household real expenditure quintile

This categorical variable classifies all households into real household expenditure quintiles, ranging from the first (1st) quintile to the fifth (5th) quintile. Using the real household expenditure is considered appropriate as the five-year interval between the two waves of the data hints at the possible role played by inflation. Using the Consumer Price Index (CPI) from FRED economic database[14] , which had 2010 as the base year, the nominal values of household expenditure are divided by the CPI values of 93.57 and 158.99 for 2009 and 2014, respectively. Being in a higher household expenditure quintile signifies a better standard of living and greater ability to undertake financial investment in the welfare of children, compared to being in lower expenditure quintiles.

3.3.3 Source of data

The Ghana Socioeconomic Panel Survey is a coaction between the Economic Growth Center (EGC) at Yale University and the Institute of Statistical, Social, and Economic Research (ISSER) at the University of Ghana, Legon. With principal funding from EGC, the survey was carried out and supervised by ISSER. The main aim of the survey was to provide a scientific framework for a wide array of potential research on the changes occurring during

[14] Accessed at https://fred.stlouisfed.org/series/DDOE01GHA086NWDB (1st August, 2020)

the development process. The survey is meant to solve a major challenge, i.e., the absence of detailed, long-term and multi-level scientific data that track individuals over time. The strategy is to permit the investigation of unexpected connections between the multiple transformations that occur along the process of economic development. The data is meant to facilitate the investigation of unexpected connections between the multiple transformations that accompany the process of development. The design of this survey sought to mitigate the selectivity associated with migration (wherein existing surveys, people who migrated were often not included), thus, permitting accurate estimates from its analysis.

The survey offers regionally representative data for all the 10 regions of Ghana. Five thousand and nine households from 334 Enumeration Areas (EAs) were interviewed. 334 Enumeration Areas (EAs) were used, as fifteen households were selected from each EA. The survey employed a two-stage stratified sample design based on the number of regions in Ghana. Using the updated 2000 Ghana Population and Housing Census master sampling frame, the first stage of choosing geographical precincts or clusters was done. In each region, a total of 334 clusters or census EAs were randomly chosen from the master sampling frame (using a simple random technique). The second selection stage involved listing all the households in the selected enumeration areas (clusters), and then administering a simple random selection of 15 listed households from each of the selected clusters. The second stage was meant to ensure that an adequate number of people completed their interviews to enhance the regional-level precision of estimates using the data. Also, there were deliberate attempts to do away with the effects of intra-class correlation that may be found within a sample area on the variance of estimates using the survey.

Data collection teams were then formed to conduct the survey, consisting of a driver, four interviewers, a senior interviewer and a supervisor. To ensure good quality control for the fieldwork and determine the survey direction, supervisory teams from ISSER regularly

visited the field. Multiple visits were used in surveying most households due to the intensity and length of the survey. Shortly after the fieldwork commenced, the processing of the survey data started. The first of two stages of data processing involved editing questionnaires to double-check for completeness and consistency and post-coding to generate new response categories for pre-coded and open-ended questions. The second stage involved data entry using CSPro version 4.0. Using the requisite skip patterns and consistency checks, the design ensured adequate data quality and validity. Double entry of responses was used to ensure 100 percent verification, and both entered files were compared for mistakes and further verification and correction. The finished files in CSPro format were then converted to STATA format for more cleaning and consistency checks.

For this analysis, the first two waves of the GSEPS data are used for this study. About 5,207 (4,617) children between the ages of 5 to 15 who took the digit-span test were observed in the first (second) wave, constituting the digit-span sample. Children between the ages of 5 to 26 took the mathematics test (5,297 in the first wave and 5,463 in the second wave) and the English language test (4,676 in the first wave and 5,463 in the second wave). Only individuals that are observed in both waves are included in the analysis. After observing the characteristics of the children, parents and other household characteristics, 2,502 children in the digit-span sample were observed in both waves and used for the estimations. Similarly, 1,764 children in the mathematics test sample and 1,664 children in the English language sample were observed in both waves.

3.3.4 Methods of analysis

This section presents the econometric methods or techniques used in the study. The main estimation technique employed is the random-effect Tobit model. The pooled OLS model is simple and constitutes the most basic frame for panel data analysis. However, it does not make use of the richness of the panel data. It assumes that all individuals have similar

covariates and that the covariates are stable over time. Thus, it ignores the potential effects of heterogeneity and may lead to inaccurate estimates. When there are persistent differences (individual heterogeneity) in the independent variables and such heterogeneity affects the dependent variable, the random-effects model may be preferred to the pooled OLS model. The Breusch-Pagan test helps to choose between the pooled OLS and random-effects models. Here, the null hypothesis is that there is no heterogeneity. Rejection of the null means the random-effects model is preferred to the pooled OLS model. Indeed, in all estimations, the null hypothesis was rejected, confirming the appropriateness of the random-effects model for the analyses.

Also, if the individual heterogeneity is significantly correlated with the independent variables, the random-effects model is most appropriate. A Hausman test is done to choose between the random-effects model and the fixed-effects model. The null hypothesis is that the differences in fixed-effect and random-effects coefficients are not systematic. In other words, the null hypothesis is that the random-effects model is preferred since the individual heterogeneity is not correlated with the regressors. A rejection of the null hypothesis (when the p-value is less than 0.05) would mean that the individual heterogeneity is significantly correlated with the regressors and the fixed-effects model is preferable to the random-effects model. For this analysis, the Hausman test was done for all the estimations, and consistently, the test failed to reject the null hypothesis. Therefore, the random-effects technique is more appropriate for the model than the fixed-effects estimation technique and is chosen for the estimations.

The dependent variables used here are the test scores from the digit-span test, mathematics test and the English language test. The scores are scaled such that they are non-negative and upper-bounded at 100 (converted to percentages). This means the dependent variables are censored since the respondents who scored 0 and 100 are included in the data. A panel Tobit

model was considered to handle the censored nature of the dependent variable if such bounded restrictions affect the results significantly. The random-effect Tobit regression is, therefore, presented.

3.4 Methods used to assess the relationship between women's economic and social empowerment and under-five child nutrition

3.4.1 Theoretical framework

In building a framework for this study, it is posited that a child's nutritional status depends on the set of nutrients consumed. A study by Ladd & Suvannunt (1976) assessed how maternal empowerment (increased maternal control of household resources) affects food demand. Thomas (1994) specified a health production function that expressed a child's health as a function of many health inputs. The inputs include nutritional intake, the quality and quantity of health care consumed by the child, child attributes and household attributes. This is a standard utility function that depends on a budget constraint.

Decision-making in the household has been espoused in unitary models, where decisions are assumed to be taken by the head of the household on behalf of the members of the household, usually, the father, as both father and mother are assumed to have a single utility function (Becker & Lewis, 1973). However, the unitary model has received criticism from Lundberg *et al*. (1997) who showed that consumption, household expenditure (on women and children), and welfare might increase when women are given more control over household resources. This study adopts the theoretical model advanced by Rosenzweig & Schultz (1983) based on a household health production function. This function was also adopted and used to investigate mothers' participation in decision making regarding spending and the effect on child nutritional status in India, which was conducted by Imai *et al*. (2014).

This study adopts the same theoretical model to examine the effect of mother's empowerment on child malnutritional status in Ghana, using two waves of the GSEPS data. Based on the cooperative bargaining model employed in most empirical studies on child nutrition and child health, household members obtain equal benefits that depend on the effectiveness of bargaining activities—assuming that a father f and a mother m constitute a household and a given number of children c. The children are regarded as 'public good' belonging to both parents. Also, the study assumes that both father and mother act or make decisions and choices (or consume goods) to enhance the quality of nutrition and health of their children in general. Let X_i be the i^{th} individual decision-maker's investment (where $i = m, f$), while H is the mean of a child's quality of health. The i^{th} individual's utility is expressed as

$$U_i(X_i, H_i, E_i) \qquad (10)$$

where E_i is a collection of exogenous factors that determine the preferences of the individual, such as personal attributes, transfer payments as well as other factors outside of the household that affects expenditure decisions made by i.

Since both f and m select X_i to maximise H, a family utility function can be expressed as

$$\beta U_f(X_f; E_f; H_f) + (1-\beta)U_m(X_m; E_m; H_m) \qquad (11)$$

where β captures the "empowerment status" of the mother or wife and lies within the range $(0 < \beta < 1)$. β may be either exogenously or endogenously determined, depending on whether parents' preferences for the child's quality of health affect a mother's empowerment status. The parents face a household's utility maximization problem as follows:

$$\text{Max U} = \beta U_f(X_f; E_f; H_f) + (1-\beta)U_m(X_m; E_m; H_m)$$

Subject to

$$I = P_m X_m + P_f X_f + P_{sq} \quad (12)$$

where I is the household's income, P_m is the price of goods consumed by the mother, P_f if the price of goods consumed by the father and P_s depicts the shadow price of children. The optimal level of the quality of a child's health $h*$ will be a function of $\beta, P_s, I, P_m, P_f, E_m$ and E_f as follows

$$h^* = h^*(\beta, P_s, I, P_m, P_f, E_m, E_f) \quad (13)$$

The empowerment status of a mother enhances her bargaining power and control over how resources are allocated. Given the strong backing in the literature that a mother is more likely to place a high value on h, increased empowerment (higher β) enhances the child's health.

3.4.2 Description of variables

The nutritional status of children is measured using the weight-for-height Z-scores (as a proxy for the short-term health status of children) and height-for-age Z-scores (as a proxy for the long-term health status of children), for children under age five on the grounds of the growth reference data from the World Health Organization (WHO)[15]. The Z-score measure as posited by the WHO in 2006 can be expressed as:

$$Z - score = \frac{X_i - X_{median}}{\delta^x} \quad (14)$$

where X_i and X_{median} are the height of child i and the median height of children within the reference group (having the same age and sex), respectively. δ^x stands for the standard deviation from the reference population's mean. This study regards children with a height-

[15] https://www.who.int/childgrowth/standards/en/

for-age Z-score below -3 as being "severely stunted," while those whose height-for-age Z-score range between -3 and -2 are deemed "moderately stunted". The factors that influence the nutritional status of children are likely to differ for undernourished and over-nourished children. The study, therefore, groups all the Z-scores into those in the undernourished category, those in the normal nutrition status category and those who are over-nourished.

Independent variables

The main independent variables used are measures of empowerment. APPENDIX C details how the empowerment measures are selected and deployed. The PCA procedure was used to predict and extract two principal components of a set of proxies for women's empowerment status. The input variables can be grouped into five broad classes namely (1) participation in family decision-making (whether or not important decisions should be made by only the men of the family and whether or not a woman can express her opinion when she disagrees with her husband), (2) attitude of women towards violence (whether or not a wife should tolerate being beaten by her husband in order to keep the family together and whether or not it is correct for her man to beat her wife if wife refuses sex), (3) autonomy (autonomy to spend wife's own earnings on herself and her children, whether or not the husband restricted the wife from contacting her family, whether or not the husband insisted on knowing wife's location at all times, (4) Societal preferences (whether or not it is better to educate a son than a daughter, couples' age difference and the wife's age at marriage) and (5) access to resources (the employment status of a wife, whether or not the wife owns land, whether or not she can access credit, whether or not she has savings).

The PCA led to the retention and prediction of two principal components. Much of the variation in the first principal component was accounted for by five input variables, namely whether or not a wife should tolerate being beaten by her husband in order to keep the family

together, whether or not the husband insisted on knowing the wife's location at all times, whether or not it is better to educate a son than a daughter. This is classified as the social empowerment measure. The second component was deemed a composite measure of the economic empowerment of women. Likewise, much of the variation in the measure of women's economic empowerment was from four input variables, namely whether or not the woman is employed, whether or not she has savings, whether or not she can borrow and whether she owns land.

Social Empowerment

Social empowerment of women constitutes the changing of social norms, institutions and relationships in such a way that enhances the agency of women. The first retained principal component of 15 input variables was as a result of a high correlation and variation from five input variables, namely whether or not a wife should tolerate being beaten by her husband in order to keep the family together, whether or not the husband insisted on knowing wife's location at all times, whether or not it is better to educate a son than a daughter. The PCA validated the existence of a factor among the listed variables, and the principal component derived is called the social empowerment measure or index. The index is normalised for all the values to range between 0 and 1, where higher values indicate increased social empowerment and vice versa.

When social norms are altered to enhance women's ability to make meaningful life choices, it affects their children's health. For instance, a woman's attitude of acceptance towards violence may signify the continuous experience or inability to do anything to avert the situation (Institute of Development Studies (IDS) & Ghana Statistical Services (GSS), 2016; Phillips *et al*., 2015). Such violence, especially during pregnancy, affects fetal growth and may cause foetal injury or premature birth, all of which affect children's health in both the short-term and long-term (Jasinski, 2004; Sharps *et al*., 2007; Silverman *et al*., 2006).

Research has shown that when women are allowed to participate in decision-making regarding issues like the timing of birth, food budg*et al*location and the volume and timing of child-related spending, the health of children is enhanced (Patel *et al*., 2007; Quisumbing, 2003; Smith *et al*., 2003). Also, when social norms are altered to remove forms of mobility restrictions on women, their ability to work and also join meaningful networks that will afford them other opportunities to engage in economic activities and earn higher incomes (Weber & Ahmad, 2014). Moreover, a woman's contact with her family is an essential social support system that helps with important albeit informal information regarding child health and nutrition (Mbekenga *et al*., 2011).

Economic Empowerment

This study regards economic empowerment as the ability of women or mothers to exercise control over economic resources directly. The bargaining literature maintains a strong link between the economic status of women and the welfare of household members (Beegle *et al*., 2001; Hoddinott & Haddad, 1995; Quisumbing & Maluccio, 2003). For instance, increased control of household resources implies an increase in food resources, improved caregiving practices and a hygienic household environment. Also, female control over resources implies the timely allocation of such resources to benefit children and other household members (Smith *et al*., 2003). It follows from conventional thinking that when women own land(s), are employed, can save and access credit, they can make efficient and timely contributions towards their health and that of their children.

One of the retained principal components of several input variables is considered to be a composite measure or index of the economic empowerment of women and is constituted by (1) the employment status of a mother; (2) whether the mother owns land; (3) whether the mother can borrow or access a loan; (4) whether a mother has savings. The predicted indexes

are then normalized to range from 0 to 1, where higher values indicate increased economic empowerment.

Child's Age

Some authors have found that a child's age is positively associated with child malnutrition, suggesting that malnutrition prevalence rises as the child's age increases. Yimer, (2000) found children between 37-48 months to have a five times higher likelihood of being underweight than 12 months old children. Hien and Kam (2008) found children between 0-11 months to have a lesser risk of being malnourished (stunted, wasted, and underweight), unlike children in the older age groups. After a child turns a year old, when weaning is likely to have started, the child may become malnourished due to inadequate diet supplementation. Children between 0-11 months are usually more secure against malnutrition due to the adequacy of nutritional supplements in mothers' breastmilk. For this study, a child's age is categorized into 1 "0-11", 2 "12-23", 3 "24-35", 4 "36-47" and 5 "48-59". The expected signs of the coefficients of the various categories can be either positive or negative.

Child's Sex

Males and females below 60 months generally have varied health risks. These differences are attributable to both biological and social differences (Vlassoff, 2007). According to Hill & Upchurch (1995) and Iqbal, Gkiouleka, Milner, Montag & Gallo (2018), the more unequal a society is, the greater the penalty paid by girls in terms of morbidity and mortality risks. They explained that such societies often favour males, and hence, health inputs such as adequate nutrition are distributed in favour of men. Besides, Hill & Upchurch (1995) noted after analysing DHS data for over 40 developing countries that although females tend to have fewer health risks, it is due to false reportage by mothers. While many studies find no significant difference in malnutrition among males and females (Bhagowalia *et al.*, 2012;

Dancer & Rammohan, 2009; Zereyesus *et al*., 2017), others have mostly found males to be worse off. Nshimyiryo *et al.* (2019) found males to have an increased likelihood of being stunted in Rwanda. Wamani *et al.* (2007) found that boys are more likely to be malnourished than girls among 16 sub-Saharan nations. In terms of child survival, Bujang *et al.* (2012) found males worse off in Malaysia. A child's sex is defined in this study as a dummy variable where 1 stands for female and 0 stands for male, with male as the reference category. The expected sign of child sex's coefficient could either be positive or negative.

Ethnicity

Ethnicity refers to a group of people with a distinctive culture, a common origin and history, identification and social traditions handed down from older and current to the future generation. Members of a particular ethnicity have distinctive features in their way of life, shared experiences and often a common genetic heritage. The distinct features that characterize their way of life may reflect their health experiences and their demand for health. From the GSEPS data set, the ethnicity of a child is categorized into 1 "Akan", 2 "Ga/Dangme", 3 "Ewe", 4 "Guan", 5 "Mo-Dagbani", 6 "Grusi", 7 "Gurma" 8 "Others". The reference category is Akan, and the expected sign of the coefficients can be either positive or negative.

Health Insurance

Health Insurance is essential in the lives of Ghanaians. When mothers and children are enrolled in the program, it improves their access to relevant child and maternal health services and enhances their health status. The likelihood of facility delivery and utilization of other maternal health services such as prenatal and antenatal care services are enhanced with health insurance enrolment (Jewell, 2009; Mensah *et al*., 2010). Essentially, health insurance coverage encourages demand for healthcare by reducing out-of-pocket payments. Although increased demand for health care is expected to reflect improved health outcomes, there is

very little evidence to support the claim (Fan *et al*., 2019; Yip *et al*., 2020). Some studies have found a weak association between insured women and the quantity and quality of demanded prenatal care (Kaestner, 1999). The health insurance status of the child is categorized as either 1 "Yes" or 0 "No". Health insurance is expected to have either a negative or positive coefficient.

Mother's Education

This variable evaluates a mother's highest attained educational level. Maternal education is categorized into; 1 "None", 2 "Primary", 3 Middle/JSS", 4 "Secondary/Vocational", and 5 "Higher". Increased educational attainment may lead to improved health outcomes (Bodovski & Farkas, 2008; Cheadle, 2008). This is because mothers with higher educational attainment are more likely to utilize medical inputs and provide better nutrition to enhance their children's health status (Prickett & Augustine, 2016). Studies have found a relationship between increased female educational attainment and improved child health (Currie & Moretti, 2003; Zakir & Wunnava, 1999). Children whose mothers have higher education are also more likely to survive (Andriano & Monden, 2019). Mother's education is expected to reduce the likelihood of wasting, stunting, being underweight and obesity, while the effect on the Z-scores cannot be determined a priori.

Mother's Age

Mother's age is a continuous variable measured in years. Younger parents usually lack the readiness for the economic and social demands of family life (Baldwin & Cain, 1980). Compared with older mothers, younger mothers are prone to increased risks of adverse birth outcomes such as preterm birth, low birth weight and child stunting at age two (Fall *et al*., 2015; Ganchimeg *et al*., 2014; Wemakor *et al*., 2018). Among low and middle-income countries, Finlay *et al*. (2011) identified under-five first-born children born to mothers aged below 27 years with higher risks of child anaemia, stunting, underweight and diarrhoea, while

Yu *et al.* (2016) found no significant association when they controlled for covariates. The expected sign of the coefficient of mother's age is either positive or negative.

Mother's height

The height of a mother (in metres) is a continuous variable that describes the innate abilities of a mother that may not be observed but can be inherited by a child. These abilities may include aspects of improved health (resistibility to diseases). In their population-based cross-sectional study in Brazil, Felisbino-Mendes *et al.* (2014) found a positive association between a mother's height and the height-for-age z-score of her child. Children could inherit such a trait (height) from their mother. Hence, a mother's height may be either positively or negatively associated with the health of her child.

Father's age

Like a mother's age, a father's age may indicate the level of preparedness for family life and childcare. The father's traditional role as the breadwinner suggests that he has to see to it that the family members are catered for (Amos, 2013). Compared to young fathers, older fathers are expected to be better placed to perform the duties of the main provider or the family. Father's age is a continuous variable and is expected to be positively related to the child's nutritional status.

Father's Education

Father's education is constructed categorically into 1 "no education", 2 "primary", 3 "secondary" and 4 "higher". According to the Ghana Demographic and Health Survey (2014) report, the educational level of a father is heavily linked to his earnings ability via the accumulation of employable knowledge and skills. Since educated fathers are better placed to earn more than fathers with no education, they are more likely to afford and provide home environments that are more nurturing or have more access to programs that can improve school readiness and child development, such as preschool (Ermisch & Pronzato, 2010;

Schady, 2011). More so, a more significant effect is expected for fathers who completed higher levels of schooling compared to those with lower levels.

Father's hours of work

Father's hours of work is a continuous variable that measures the total number of hours worked by a father within a week. It is the product of the daily work hours and the number of days on which he has worked within a week. The more hours a father spends on work, the more his earnings. Increased earnings make more money available to cater for the family and spend on the family's feeding needs. The coefficient is expected to be positively signed.

Father's height

The height (in metres) of a father is a measure of the father's innate abilities that can be passed on to a child. It can be passed onto his progeny genetically and culturally, that is, through the eating and physical habits adopted by the family. The expected sign of a father's height on child nutrition is either positive or negative.

Expenditure Quintile

The expenditure quintile variable categorises households into five groups according to their levels of expenditure. The categories are 1 "first quintile", 2 "second quintile", 3 "third quintile", 4 "fourth quintile" and 5 "fifth quintile", where higher quintiles indicate higher expenditure. The level of household expenditure has a direct reflection on the welfare of the members of the household. Households within higher expenditure quintiles are more likely to afford good food and healthcare, making members of such households less likely to be malnourished. However, the possibility of overfeeding in the abundance of funds to spend may also cause obesity among family members. The sign of the household expenditure quintile can be either positive or negative.

Household Size

Household size describes the number of people occupying a housing unit. The variable is, therefore, continuous. It is expected that households with more individuals, especially when there are many dependents, would experience the effects of increased pressure on disposable income and other facilities (Ahmed *et al*., 2016; Hadley *et al*., 2011). Alternatively, large-sized households may also have more working members. Thus, more earnings may be available to finance food and other expenses and improve the nutritional outcomes of children. The sign of the household size's coefficient can be either negative or positive.

Drinking Water

Drinking water is a categorical variable that describes the sources from which a household gets water meant for drinking. The source of water for drinking affects the quality of nutrition as drinking water and water used for food remains an essential part of the food. Following the JMP standard (WHO/UNICEF, 2018), drinking water is categorised as 1 "Surface water", 2 "Unimproved water", 3 "Non-piped improved water", 4 "Piped outdoors" and 5 "Piped indoors". Surface water consists of water from rivers, streams, rainwater, springs, dugouts, ponds, lakes and dams. Unimproved water consists of water from unprotected wells. Non-piped improved water sources include water from a water truck or tanker services, water vendors, sachet or bottled water, boreholes and protected wells. Piped outdoor sources of water are also improved and pipe-borne, but not within the house compound. It captures water from public standpipes, private outside standpipes and pipes in the neighbouring household. Piped indoor sources are improved, pipe-borne and located inside the compound. It is expected that using improved sources of water will be positively associated with improved child nutrition outcomes.

Toilet facility

This variable describes the type of toilet facility used by members of the household. The type of toilet facility is an indicator of the quality of sanitation of a household. The Joint

Monitoring Program (JMP) for Water Supply and Sanitation provides a guideline for categorising the type of toilet facility into improved and non-improved sanitation (WHO/UNICEF, 2018). Improved sanitation is defined to include access to flush toilet, pit latrine with slab and KVIP. Unimproved sources include using the public or shared toilet, a pan or bucket and a toilet in another house. Toilet facility is categorised as 0 for "Unimproved" and 1 for "Improved". Using an improved toilet facility is likely to minimize the possibility of faecal matter contamination of food and the environment, and other related infections. It is expected that using improved toilet facilities will be positively associated with improved child health.

Urban

Locality immensely affects a child's chances of survival as well as his or her health status. Some studies have shown that the probability of survival and improved nutrition for children, and improved health for adults is lower in rural areas than in urban areas (Smith *et al.*, 2005; Yi *et al.*, 2011). One would readily assume that urban areas have better infrastructures (such as health facilities) than rural areas and so urban dwellers would have better health. However, urban areas are more densely populated. This means more pressure on infrastructures, sanitation and waste management services (Koop & van Leeuwen, 2017). Indeed, increased pressure on sanitation, waste management facilities and health facilities may worsen the health of urban dwellers. Urban is a dummy variable that assumes the value 1 if the child lives in an urban area and 0 if the child lives in a rural area. The coefficient of "Urban" can be either positive or negative.

Radio

Radio is a dummy variable that assumes the value 1 if a household has at least one radio set and 0 if otherwise. Having access to a radio set indicates having access to information that can be beneficial to children, mothers and the whole household. Several educative contents

can be made available to mothers and other family members, which can affect the health of family members. The radio set can serve as a source of information for the very poor and the illiterate. It is relatively cheaper to buy and offer news and other programmes in the local dialects.

Region

Children born in different regions of Ghana face different levels of nutritional attainment. This is due to the differences in economic and social endowments regarding amenities and resources that support good nutritional attainment and improved health. When a child is born or lives in regions with better economic and socio-cultural environments and circumstances that support better nutritional status, that child is better placed to be well-nourished than other children in regions that lack adequate economic and socio-cultural environments. Studies have shown that malnutrition is more prevalent in the Northern parts of Ghana. According to Boah *et al.* (2019), Children in the Northern Region of Ghana are three times more likely to be stunted. Region is categorized as 1 "Western region", 2 "Central region", 3 "Greater Accra region", 4 "Volta region", 5 "Eastern region", 6 "Ashanti region", 7 "Brong Ahafo region", 8 "Northern region", 9 "Upper east region", and 10 "Upper West region". The reference category is the Greater Accra Region, and the expected sign of the coefficients can be either positive or negative.

3.4.3 Source of data

The main source of data is the Ghana Socioeconomic Panel Survey which came about due to a collaboration between the Economic Growth Center (EGC) at Yale University and the Institute of Statistical, Social, and Economic Research (ISSER) at the University of Ghana, Legon. The first and the second waves of the panel data are used for the analysis. Further details can be found in section 3.3.3 discussed above. Since the study focused on children under five years of age and the data is a panel with five-year intervals, the panel

properties of the data could not be used. The data observed 2,481 (1,795) under-five children in the first (second) wave. Both waves are pooled together for the estimations, and the wave (time period) is added as a control variable.

3.4.4 Methods of analysis

This study examines how the Z-scores for long-term and short-term child nutrition measures are related to the mother's empowerment status in Ghana. Essentially, this part of the econometric analysis, using data from Ghana, examines the determinants of child malnutrition by testing whether the mother's economic and social empowerment and other household factors (including characteristics of the children, parents and infrastructure) are related to children's nutritional status. Multiple estimation techniques are used to distinguish this study from most existing ones in Ghana. The study estimates different magnitudes of effects or coefficients at varying points in the conditional distribution of nutritional status instead of estimates at the mean as done in most existing Ghanaian studies, using the Quantile regression technique. An adequate comparison is made with the results from the ordinary least square (OLS) estimations. Ordinary least squares estimations yield consistent results when none of the covariates is determined within the model and therefore endogenous.

The empowerment measures have the likelihood to be endogenous. It can be argued that a wife's ability to make meaningful contributions towards family decision-making and engage in household bargaining depends on the husband's characteristics and the wife herself. More understanding and tolerant men will welcome their wives' opinions when decisions are being made. Also, some innate abilities such as a wife's ability, determination and self-esteem may exert some form of influence on household preferences and decision-making. These traits, although unmeasured, may also affect the level of inputs channelled into the health of family members. Such unobserved effects may be positively associated with both women's

empowerment and the health of children. Indeed, the null of exogeneity of the empowerment measures was rejected, confirming that they are endogenous (see APPENDIX D (Table D1)). Although the author controls for the height of both parents (as a proxy for innate abilities), the possible effect of endogeneity is dealt with using a standard instrumental variable approach. An instrument is constructed to deal with this possible endogeneity, namely, the cluster differences between male and female deaths. The advantage offered by this cluster-level instrument as opposed to other individual-level instruments identified in the literature, such as the age difference between the couple (Smith *et al*., 2003), is that the cluster-level instruments are less likely to be associated with the unobserved characteristics of both partners. Differences in the incidence of mortality between boys and girls may be a direct result of how household resources are allocated between boys and girls. When either gender is favoured in input allocation, that gender may be more empowered within their locality. Some studies have noted that discrimination against women underlies the high mortality rates for females in those areas (Arnold, 1992; Arnold, Choe & Roy, 1998; Muhuri & Preston, 1991)

Regarding the theoretical framework explained above (Section 3.4.3), the study uses a simpler version of the bargaining model. Due to the difficulty in identifying the exact variables that will fit the model explained above, a reduced-form equation approach is employed. Here, child nutritional status is expressed as a function of household characteristics and bargaining indicators. The GSEPS data does not have variables that capture the individual unearned income or parent's consumption prices. The nutritional status indicator (z_{ih}) as:

$$z_{ih} = z_{ih}(E_h, C_i, M_h, F_h, \mathrm{X_h}) \qquad (15)$$

where Z_{ih} refers to the Z-score of either height-for-age or weight-for-height. Also, *i* denoted the *i*th child, and *h* denoted the *h*th household in a total sample at a given time t (year). Mother's empowerment is captured by E_h representing the mother's bargaining power and comprises our central independent variable. C_i is a vector of the *i*th child's characteristics and includes the gender of the child; age category of the child; whether the child has a health insurance policy cover; ethnicity and religion. M_h is a vector of maternal characteristics including mother's age, mother's education and Mother's height. F_h is a vector of paternal characteristics including father's age, father's education, father's work hours and father's height. X_h is a vector of household characteristics such as household expenditure quintile, household size, region, source of drinking water and toilet facility. The following empirical model is specified:

$$\begin{aligned} Ntr_i = {} & \beta_0 + \beta_1 Emp + \beta_2 Cage_a + \beta_3 Fem_b + \beta_4 Rel_c + \beta_5 Ceth_d + \beta_6 Mage_e + \beta_7 Med_f + \beta_8 Mhgt \\ & + \beta_9 Fage + \beta_{10} Fed + \beta_{11} Fhgt + \beta_{12} Fwh + \beta_{13} Hsize + \beta_{14} ExpQ_f + \beta_{15} DrW_g + \beta_{16} Isan_g + \beta_{17} Rad \\ & + \beta_{18} Urb_h + \beta_{19} Reg_j + \beta_{20} wav_l + \varepsilon \end{aligned} \quad (16)$$

where *Emp* is the vector of empowerment measures (economic empowerment and social empowerment) of a mother (they are used in different specifications as the correlation between them is expected to be high), *Cage* is child's age, *Fem* is female, *Ceth* is child's ethnicity, *Rel* is the religious affiliation of the child, *Mage* is mother's age, *Med* is mother's education, *Mhgt* is mother's height, *Fage* is father's age, *Fed* is father's education, *Fwh* is father's work hours, *Fhgt* is father's height, *Hsize* is household size, *ExpQ* is household expenditure quintile, *Drw* is the source of drinking water, *Isan* is a dummy variable that indicates the usage of improved toilet facility, *Urb* is urban, *Rad* is access to radio, *Reg* is region and *wav* is wave

It is useful to examine how the independent variables are related to child nutritional status on the different spots in its conditional distribution. This is because a child's nutritional status may be impacted differently by predictors on different points on the conditional distribution of nutrition. For instance, the empowerment status of a mother may affect a malnourished child differently from how it affects an over-nourished child. In other words, a predictor may be more relevant at different parts of the conditional distribution of nutrition. The quantile regression for the ϕth percentile can be specified as:

$$\min_{b \in R^N} \left[\sum_{i \in (i: q_i \geq X_i b)} \phi |q_i - x_i b| + \sum_{i \in (i: q_i < X_i b)} (1-\phi) |q_i - x_i b| \right] \quad (17)$$

where $0 < \phi < 1$, q_i is a dependent variable that denotes the Z-score of child nutritional status and X_i is a vector that contains the explanatory variables in equation (15). To evaluate the determinants of the nutritional condition for each group, the median of each nutritional group is chosen as the ϕ. For instance, if 20 percent of children have a Z-score below -3 (severely undernourished, ϕ a value of 0.1 is used. The study also uses the bootstrap estimates of asymptotic variance with 1000 repetitions to deal with the possible issue of heteroscedasticity that may exist among the error terms of each of the groups.

CHAPTER FOUR

EMPIRICAL RESULTS: THE EFFECT OF WOMEN'S POLITICAL EMPOWERMENT ON WELFARE IN AFRICA

4.1 Introduction

This chapter details the empirical findings on the effect of women's political empowerment on welfare in Africa. It begins by presenting and discussing the summary statistics. Then, the empirical evidence on the effect of women's political empowerment on welfare in Africa follows.

4.2 Summary statistics

Table 4.1 gives the summary statistics of the selected variables used in the study (see APPENDIX E for the definitions of the variables). The HD index and household income are the dependent variables employed. The mean and standard deviation for the HD from 1990 to 2017 are 0.09 and 0.11, respectively. As this data is computed with 1990 as the reference point, a minimum of -0.29 and a maximum of 0.5 signify that although some countries experienced huge improvements in welfare, others retrogressed (such as Swaziland and Lesotho). For the sampled African countries, the average political empowerment value was 0.66, topping the global sample average of 0.60. It ranges from 0.21 to 0.92, while the standard deviation of 0.15 shows that most of its values are clustered around the mean. The average monthly household income for the sampled countries is 128.69 PPP dollars, ranging from 22.6 PPP dollars to 670.3 PPP dollars.

The measure of economic growth (predicted annual growth rate of GDP) used in this analysis has a mean value of 5.02 but ranges between 4.96 and 9.83. Among the countries considered, the average government expenditure is 4.58 (% of GDP), with minimum and maximum values of 0.04% and 44.33%. About 40 percent of the population lives in urban areas. While

about 68.2 percent of the populations of the sampled countries have access to improved water, only about 34.2 per cent has access to improved sanitation facilities. The sampled countries have an average Gini index of 39.3% while ranging from 35.72% to 41.24%. This shows that, on average, the sampled countries are very close to the warning score of 0.4, as opined by (Teng *et al*., 2011; Tu *et al*., 2017). Beyond the 0.4 line, a country or region stands a higher risk of disharmony, rural and remote poverty, hostility and crime (Han *et al*., 2016) Ranging from 0.11 (Congo, Democratic Republic) to 0.9 (Namibia), the mean quality of governance is 0.4. Libya and Sudan have the lowest democracy index while Cape Verde has the highest; the average democracy index for the sampled countries is 4.89. Overall, there is enough variation among the variables, and the data is thus conducive for the analysis. The following sections discuss the results of the various estimations.

Table 4. 1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HD	205	0.45	0.14	0.11	0.82
Household Income	205	128.69	95.59	22.60	670.35
Women's political empowerment	205	0.66	0.15	0.21	0.92
Economic growth	205	5.02	4.73	4.96	9.83
Inequality	205	39.27	1.10	35.72	41.24
Political instability	205	0.02	0.12	0	1
Government spending	205	4.58	3.21	0.04	44.33
Age dependency ratio	205	85.20	14.62	44.35	111.67
Urbanization	205	39.92	15.95	11.56	86.92
Access to improved water	205	68.23	16.74	28.90	99.20
Access to improved sanitation	205	34.15	23.50	3.90	96.50
Quality of governance	205	0.42	0.13	0.11	0.90
Democracy index	205	4.89	2.29	0.67	9.33
Inflation	205	17.63	64.96	-35.84	1096.68
Openness	205	69.22	30.96	14.77	311.36

Source: Author's computation
The sample is based on fixed-effect estimation of the model in equation (4). It is particularly limited by the missing observations in the income inequality[16] variable.

[16] The income inequality data is obtained from national surveys which are usually conducted in an average of five-year intervals for most countries in Africa

4.3.1 Regression results and discussion

Table 4.2 presents the effect of women's political empowerment on the non-income measure of welfare (HD) among African countries. The identification strategy is founded on employing an instrument (the ratio of property rights to women lagged by a period to the legal origin) to deal with potential endogeneity between women's political empowerment and HD (see section 3.2.4 for a detailed justification). The Kleibergen–Paap F weak identification test statistic tests for the correlation between the excluded instrument and the included endogenous variable. In other words, it examines the strength and suitability of the instruments. The statistic is higher than the conventional threshold of 10, as Staiger & Stock (1997) suggested in most estimations.

Furthermore, the goodness-of-fit of the models as adjudged by the adjusted R-squared attests to the fact that the models are well-fitted and explain between 63.1 percent and 81 percent of all variations in HD. Hereafter, model 3 remains the most preferred model as it presents 2SLS-FE estimates and has the lowest AIC estimate.

Model (1) of Table 4.2 reports that the 2SLS estimation coefficient on women's political empowerment proxied by the women's political empowerment index is positive and significant at the 5 percent level of significance. Specifically, a percentage increase in women's political empowerment index increases the HD index by about 0.3 percent. It is noteworthy that 2SLS regression does not factor in the country fixed effects and may affect the validity of the results. Indeed, a Hausman specification test validates the importance of the country fixed-effects as the null of no systematic difference between random-effect and fixed effect is rejected. As the difference is attributable to the presence of the country fixed-effects, results from fixed-effect estimation (without any external instrument) are presented in Model (2). The results show that a percentage change in the women's political empowerment index increases the HD index by 0.22 percent. Due to the potential endogeneity caused by

reverse causality between HD and women's political empowerment, the 2SLS-FE estimator is employed in Model (3).

The Hansen test for Model 3 cannot be rejected at conventional significance levels, attesting to the exogeneity of the instruments. Besides, the Stock–Wright LM statistic affirms the relevance of the endogenous regressors. Moreover, the Kleibergen–Paap F statistic and the Cragg-Donald Wald F statistic are all above the rule of thumb threshold of 10. The 2SLS-FE estimates in Models (3) show that increasing women's political empowerment by 1 percent would increase HD by 0.23 points, which is consistent with the 2SLS result.

The results support the proposition that the political empowerment of women is a strong positive predictor of the non-income aspects of welfare in African countries. The findings echo those reported by O'Keefe (2017), Jayasuriya *et al*. (2013) and Xu (2015), who empirically established a positive effect of women's political empowerment on welfare. The impact size is modest, albeit not negligible. To illustrate, the average women's political empowerment index value for the sampled African countries is 0.66 (and 0.63 for all African countries) over the period of analysis. European and American countries had an average score of 90% and 80%, respectively. If in 2017, African countries had scored about 35% (22%) higher on the women's political empowerment index, the HD would have increased from 0.45 to 0.61 (0.45 to 54) which are still low. Such low levels or gaps in welfare achievements throws more light on the historical development deficits in African countries and which may take stronger and broader efforts to correct. Women's political empowerment can therefore contribute to correcting this deficit.

The study also finds the effect of economic growth on welfare to be positive and significant in all the models. Based on Model (3), a percentage increase in economic growth yields a 0.32 percent increase in HD at the 1 percent level of significance. This agrees with a myriad

of studies such as Iheoma (2014), Ranis *et al*. (2000) and Zahari & Sudirman (2017) that provide evidence of the effect of economic growth improves welfare levels.

Table 4. 2 Effect of women's political empowerment on non-income welfare among African countries (two-stage least squares-fixed effect estimations)

VARIABLES	(1) 2SLS log of HD	(2) FE log of HD	(3) 2SLS-FE log of HD
Women's political empowerment	0.299***	0.221**	0.234**
	(0.070)	(0.112)	(0.108)
Economic growth	0.302***	0.326***	0.321***
	(0.150)	(0.082)	(0.072)
Government expenditure	0.006	0.009	0.003
	(0.011)	(0.009)	(0.006)
Urbanization	0.030	0.274	0.478***
	(0.027)	(0.227)	(0.092)
Access to improved water	0.338***	0.832***	0.814***
	(0.065)	(0.183)	(0.076)
Access to improved sanitation	0.166***	0.539***	0.505***
	(0.019)	(0.115)	(0.055)
Age dependency ratio	-0.611***	0.132	-0.118**
	(0.058)	(0.129)	(0.055)
Quality of governance	0.029	0.126**	0.120***
	(0.039)	(0.058)	(0.032)
Index of Democracy	0.064**	0.040	0.067**
	(0.026)	(0.032)	(0.026)
Political instability	-0.283	-0.106	-0.116
	(0.237)	(0.107)	(0.102)
Openness	0.181***	0.060	0.055**
	(0.026)	(0.038)	(0.023)
Income inequality	-0.116	-0.055**	-0.270**
	(0.102)	(0.023)	(0.116)
Constant	0.265	-2.568***	
	(0.930)	(0.993)	
Time dummies	Yes	Yes	Yes
Number of countries	34	34	34
Observations	205	205	205
R-squared	0.738	0.805	0.823
Adjusted R-sq	0.646	0.646	0.646
AIC	-585	-604	-665
Kleibergen-Paap F	152.972		65.990
Cragg-Donald Wald F statistic	199.323		154.203
Stock-Wright LM statistic	25.50		17.78
(p-value)	0.0000		0.0000
Hansen (p-value)	0.1002		0.2279
Hausman (p-value)		0.0012	0.0012

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The degree of urbanization also positively affects non-income welfare at the 1 per cent significance level in all the models estimated. A percentage increase in the rate of urbanisation yields a 0.48 percent increase in HD, supporting the findings of Atkinson *et al*. (2016) and Schultz (1993). The results reveal a positive effect of access to improved water and sanitation on welfare, as found by Rajkumar & Swaroop (2008). The elasticities of HD to changes in access to improved water and sanitation are 0.8 and 0.51, respectively. Also, a percentage increase in the age-dependency ratio leads to a 0.19 percent reduction in the non-income HD index. This shows that the government would have to divert resources to solve other dependency-related issues such as pensions, utility cost subsidies, and security maintenance when the dependency rate is high, echoing the findings (Hasan & Waheed, 2021).

Also, a percentage increase in the quality of governance index (index of democracy) yields a 0.12 percent (0.08 percent) increase in HD. This shows that building quality institutions is essential for welfare enhancement, affirming the findings of Ahmad & Saleem (2014), Brown & Mobarak (2009), Fallon *et al*. (2012), Keser & Gökmen (2018) and Nandha & Smyth (2013). The results also show that income inequality significantly reduces HD at the 5 percent level, as a percentage increase in income inequality causes a 0.27 percent reduction in HD.

Table 4.3 presents results from the 2SLS-FE estimations of the effect of women's political empowerment on household income among African countries. With a similar identification strategy to the one adopted for the analysis of HD above, the Kleibergen–Paap F statistic is higher than the conventional threshold of 10 as suggested by Staiger & Stock (1997) in most estimations. Furthermore, the goodness-of-fit of the models as adjudged by the adjusted R-squared attest to the fact that the models are well-fitted and explain between 42 percent and 79 percent of all variations in household income. Again, Model 3 is most preferred as it

inculcates the country fixed-effects and appropriate instruments for women's political empowerment, thus, presenting causal effects.

Table 4. 3 Effect of women's political empowerment on household income among African countries

VARIABLES	(1) 2SLS Household Income	(2) FE Household Income	(3) 2SLS-FE Household Income
Women's political empowerment	1.214***	0.163	0.430**
	(0.375)	(0.149)	(0.214)
Government expenditure	-0.047	0.007	0.004
	(0.072)	(0.015)	(0.012)
Urbanization	1.247***	1.132**	1.052***
	(0.143)	(0.440)	(0.164)
Access to improved water	0.795***	0.644**	0.572***
	(0.217)	(0.299)	(0.135)
Access to improved sanitation	1.289***	0.374	0.444***
	(0.102)	(0.291)	(0.108)
Age dependency ratio	-3.174***	-1.179***	-1.089***
	(0.360)	(0.226)	(0.121)
Quality of governance	-0.243	0.048	0.015
	(0.190)	(0.099)	(0.064)
Index of democracy	0.342***	0.100	0.063
	(0.132)	(0.062)	(0.045)
Political instability	-0.978	0.117	0.200
	(0.911)	(0.109)	(0.141)
Inflation	0.157*	-0.019	-0.007
	(0.092)	(0.022)	(0.017)
Income inequality	-3.652***	-0.159	-0.027
	(0.680)	(0.220)	(0.227)
Constant	11.145***	9.849***	
	(2.868)	(1.751)	
Time dummies	Yes	Yes	Yes
Number of countries	34	34	27
Observations	203	204	205
R-squared	0.440	0.791	0.780
Adjusted R-sq	0.429	0.787	0.763
Kleibergen-Paap F	126.07		59.864
Cragg-Donald Wald F statistic	192.16		145.449
Stock-Wright LM statistic	29.43		8.96
(p-value)	0.0000		0.0113
Hansen (p-value)	0.0847		0.1844
Hausman (p-value)		0.0001	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From model (3), the coefficient of the women's political empowerment index is positive and significant at a 1 percent level of significance. Specifically, a percentage increase in women's political empowerment index increases household income by 0.43 percent. This finding is closely related to that of Beaman *et al*. (2009), Chattopadhyay & Duflo (2004) and Ghani *et al*. (2013), who found evidence of a positive causal relationship between women's political empowerment and the economic status of women. According to Ghani *et al*. (2013), women in leadership positions affect the willingness of women to engage in gainful labour supply as issues of concern to women, especially those related to their decision to work, are usually addressed by female leaders.

The degree of urbanization also positively affects income at the 1 per cent significance level in all the models estimated. A percentage increase in the rate of urbanisation yields a 1.05 percent increase in income, supporting the findings of Atkinson *et al*. (2016) who provide evidence that urbanization leads to increased levels of welfare. The results reveal a positive effect of access to improved water and sanitation on welfare, as found by Rajkumar & Swaroop (2008). The elasticities of income to changes in access to improved water and sanitation are 0.57 and 0.44, respectively.

4.3.2 Relative effect of women's political empowerment and other covariates

The study further employs the dominance analysis to examine the importance of the political empowerment index and the other covariates. The dominance analysis provides the dominance statistic, the standardised dominance statistic and the rank. The dominance statistic is the weighted average incremental contribution to the overall fit statistic or R-squared attributable to each covariate. These are reported in Table 4.4 and Table 4.5 for the non-income HD measure and household income, respectively.

The results show that women's political empowerment ranks third (next to access to improved water and economic growth) in the non-income HD model. However, with regards

Table 4. 4 General dominance test for covariates

Non-income HD	Dominance Stat.	Standardized Dominance Stat.	Ranking
Women's political empowerment	0.1683	0.2091	3
Economic growth	0.199	0.2473	2
Political instability	0.0017	0.0021	12
Government spending	0.0292	0.0363	6
Urbanization	0.0623	0.0774	4
Access to improved water	0.2426	0.3015	1
Access to improved sanitation	0.0332	0.0413	5
Quality of governance	0.0102	0.0127	10
Age dependency ratio	0.0223	0.0278	7
Democracy index	0.0117	0.0145	9
Openness	0.0054	0.0067	11
Inequality	0.0188	0.0233	8
Overall Fit Statistic	0.8045		

Author's computation using STATA 15.
Note: The command "domin" is executed to additively decompose the contribution of each independent variable to the fit statistic. General dominance statistics are reported

Table 4. 5 General dominance test for covariates

Household Income	Dominance Stat.	Standardized Dominance Stat.	Ranking
Women's political empowerment	0.0634	0.0801	5
Political instability	0.0009	0.0011	11
Government spending	0.0223	0.0281	7
Urbanization	0.2068	0.2615	1
Access to improved water	0.1507	0.1905	2
Access to improved sanitation	0.1332	0.1684	4
Quality of governance	0.0061	0.0077	10
Age dependency ratio	0.0158	0.02	8
Democracy index	0.0451	0.0571	6
Inflation	0.0061	0.0077	9
Inequality	0.1406	0.1778	3
Overall Fit Statistic	0.791		

Author's computation using STATA 15.
Note: The command "domin" is executed to additively decompose the contribution of each independent variable to the fit statistic. General dominance statistics are reported

to household income, urbanisation, access to improved water, and income inequality are the first three contributors to the fit statistic in the household income model. At the same time, political empowerment is ranked fifth. These tests have shown that the political empowerment of women needs to be given more attention in various attempts to improve both the income and non-income aspects of welfare in Africa.

4.3.3 Robustness Checks

Table 4.6 presents GMM estimates which are meant to account for the persistent nature of the welfare measure. Models (1) and (2) show the results from 1-step difference-GMM and 2-step difference-GMM, respectively. Women's political empowerment is rightly signed only significant in model (2) at the 5 percent level. In models (3) and (4), the 1-step and 2-step system GMM estimation techniques are deployed, using the HD measure (non-income welfare measure) as the dependent variable. Women's political empowerment is rightly signed and significant at the 5 percent and 1 percent significance levels for models (3) and (4). This effect may be due to the much better finite sample properties of the system-GMM technique and can be deemed more reliable than the difference-GMM technique.

Table 4.7 presents GMM estimates which are meant to account for the persistent nature of the welfare measure. Women's political empowerment is rightly signed but not significant in the first two models, while it is marginally significant in model (3). The 2-step system GMM, however, showed that women's political empowerment is highly significant at the 1 percent level. It can be concluded that the key results are fairly robust to alternate estimation techniques such as the difference GMM and the system GMM estimation techniques.

Table 4. 6 Effect of women's political empowerment on welfare among African countries (Robustness to GMM estimation)

VARIABLES	(1) 1-step DGMM HD	(2) 2-step DGMM HD	(3) 1-step SGMM HD	(4) 2-step SGMM HD
Lagged HD	0.296**	0.284***	0.591***	0.606***
	(0.128)	(0.069)	(0.056)	(0.024)
Women's political empowerment	0.507*	0.441**	0.160**	0.195***
	(0.267)	(0.168)	(0.064)	(0.049)
Economic growth	0.162	0.391	0.414**	0.268**
	(1.430)	(0.802)	(0.179)	(0.106)
Government expenditure	0.003	0.023	0.014	0.026
	(0.060)	(0.046)	(0.026)	(0.019)
Urbanization	0.238	0.295**	0.002	0.035
	(0.191)	(0.135)	(0.031)	(0.023)
Access to improved water	0.418	0.581**	0.067	0.109**
	(0.355)	(0.228)	(0.064)	(0.050)
Access to improved sanitation	0.081	0.138	0.072**	0.086***
	(0.395)	(0.231)	(0.033)	(0.019)
Age dependency ratio	-0.252	-0.285	-0.358***	-0.295***
	(0.322)	(0.194)	(0.120)	(0.077)
Quality of governance	0.247*	0.282***	0.060	0.060*
	(0.145)	(0.083)	(0.069)	(0.031)
Index of democracy	0.026	0.057	0.042	0.058***
	(0.065)	(0.049)	(0.031)	(0.020)
Political instability	-0.394	-0.601***	-0.581**	-0.556***
	(0.270)	(0.164)	(0.282)	(0.132)
Openness	0.121	0.116***	0.056*	0.064***
	(0.078)	(0.035)	(0.031)	(0.024)
Income inequality	-0.482	-0.555**	-1.157***	-1.334***
	(0.442)	(0.249)	(0.399)	(0.114)
Constant			6.144***	6.394***
			(1.661)	(0.475)
Time dummies	Yes	Yes	Yes	Yes
Observations	117	117	159	159
Number of countries	32	32	42	42
Autocorrelation (1st order)	0.062	0.164	0.056	0.404
Autocorrelation (2nd order)	0.876	0.840	0.880	0.672
Sargan p-value	0.052	0.052	0	0
Difference-in-Sargan p-value	0.250		0.68	
Hansen p-value		0.112		0.250
Difference-in-Hansen p-value		0.111		0.985

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. 7 Effect of women's political empowerment on household income among African countries (Robustness to GMM estimation)

VARIABLES	(1) 1-step DGMM HH Income	(2) 2-step DGMM HH Income	(3) 1-step SGMM HH Income	(4) 2-step SGMM HH Income
Lagged HH income	0.842***	0.921***	0.955***	0.998***
	(0.125)	(0.164)	(0.026)	(0.021)
Women's political empowerment	0.18	0.252	0.150*	0.186***
	(0.303)	(0.443)	(0.087)	(0.041)
Government expenditure	0.090	0.099	0.007	0.082*
	(0.066)	(0.118)	(0.048)	(0.043)
Urbanization	0.042	0.033	0.100*	0.095
	(0.204)	(0.156)	(0.054)	(0.058)
Access to improved water	0.466*	0.423	0.081	0.083
	(0.263)	(0.306)	(0.097)	(0.063)
Access to improved sanitation	0.061	0.084	0.138*	0.145***
	(0.205)	(0.334)	(0.080)	(0.044)
Age dependency ratio	-0.547**	-0.487	-0.141	-0.053
	(0.264)	(0.315)	(0.141)	(0.135)
Quality of governance	0.106	0.113	0.158***	0.171***
	(0.098)	(0.071)	(0.057)	(0.030)
Index of democracy	0.046	0.050	0.021	0.007
	(0.065)	(0.086)	(0.052)	(0.036)
Political instability	-0.041	-0.101	-0.041	-0.001
	(0.237)	(0.156)	(0.251)	(0.060)
Inflation	0.023	-0.121	0.185	0.112
	(0.172)	(0.199)	(0.124)	(0.103)
Income inequality	0.871	0.996	-0.031	0.260
	(0.644)	(0.753)	(0.554)	(0.200)
Constant			1.107	-1.954
			(2.846)	(1.838)
Time dummies	Yes	Yes	Yes	Yes
Observations	40	40	71	71
Autocorrelation (1st order)	0.025	0.1	0.09	0.055
Autocorrelation (2nd order)	0.107	0.289	0.696	0.405
Sargan p-value	0.301	301	0.049	0.049
Difference-in-Sargan p-value	0.26		0.01	
Hansen p-value		0.097		0.899
Difference-in-Hansen p-value		0.142		0.114

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4 Summary of the main findings

This chapter estimates the effect of women's political empowerment on income (household income) and non-income (a newly created human development index) components of development. It is argued that giving women access to resources may not be as development-enhancing as given women control over resources. This chapter employs a number of estimation techniques to check for the consistency of the results.

The results show that politically empowering women has a significant positive effect on both the non-income measure of welfare and household income. The results indicate, as well, that economic growth, income inequality, urbanization as well as access to improved water and sanitation significantly influence the levels of welfare attained by individuals. This result was found to be reasonably robust to system-GMM as an alternate estimation technique.

CHAPTER FIVE

EMPIRICAL RESULTS: THE EFFECT OF WOMEN'S ECONOMIC AND SOCIAL EMPOWERMENT ON THE COGNITIVE DEVELOPMENT AND ACADEMIC ACHIEVEMENT OF WARDS IN GHANA.

5.1 Introduction

This chapter is divided into two main sections. The first section presents the descriptive and summary statistics of the variables used in the estimations. The second section presents the empirical findings on the effect of women's empowerment on wards' cognitive development and academic achievement.

5.2 Descriptive and summary statistics

Table 5.1 presents the descriptive statistics of all the variables used in the panel study. Three test scores are employed in this analysis: the digit span test, the mathematics test, and the English language test. All three tests are scaled as percentages. The digit-span test (mathematics and English language test) was administered to children or wards aged 5 to 15 (9 to 26) years. A total of 5207 observations for the digit-span test were recorded in wave 1 while 4,617 observations were recorded in wave 2. This led to restricting the actual sample to the 4,617 who took the test in both waves, yielding 9,234 observations. The children's data, the women's data and other data files (to have a wide range of control variables) were merged with the household roaster. After merging the children's data, women's data, employment data and household assets data into the household roster and ensuring that only children that fall within the requisite age range are included, a total of 2,396 observations remained in the digit-span sample and are used for the analysis. Going through the same procedure for the mathematics and English language test samples yielded 1,685 and 1,548 respondents.

It must be noted that in the second wave (after about five years), some of these children would have outgrown the age range for the test scores and would be out of the estimation samples. Also, most of the respondents in the digit-span sample in the first wave of the data are captured in the mathematics and English language test sample, while all of them move into the mathematics and English language test sample in the second wave. One way to go around this would have been to limit the samples to only the age ranges that overlap and not use children in the ages that are affected by the age-induced attrition. However, this would be at the expense of many observations being dropped and degrees of freedom being lost. Hence, the panel used for the analysis is not balanced. However, this natural or systematic attrition is not expected to affect the validity of the results, although the coefficients may be either underestimated or overestimated (Feng *et al*., 2006). Indeed, over a person's lifetime, cognitive development is likely to plateau after a person attains age 20 when the conditional distribution of cognitive development is considered (Strittmatter *et al*., 2020). Thus, the implication for the digit-span test and the academic achievement (mathematics and English language tests) may differ. The affected age brackets of wards for the academic achievement tests are wards between 22 and 26 years in the first wave (as they will all be above 26 years in the second wave). Given that the rate of change in cognitive development at this age is marginal, it is expected that the validity of the results will not be affected. With the digit-span sample whose affected age bracket is between 11 and 15 years, the age-induced attrition may lead to underestimating the results, which must be noted when interpreting the results.

For the study subsample aged 5 to 15 years, the wards had an average digit span test score of 28.5%. For the subsample aged 9 to 26 years, the average mathematics score was 64.1%, compared to the mean English language score of 49.6%. The two indexes for empowerment, namely, women's social empowerment and economic empowerment, are normalised and range between 0 and 1. The average social empowerment index and economic empowerment

index for the mothers of wards in the digit-span test sample are 0.68 and 0.87. The mothers of wards in the mathematics and English language test samples had an average social empowerment index value of 0.68, while the average economic empowerment index was 0.87. The average years of schooling of the respondents in the digit-span sample (mathematics and English language sample) was about 4 years (6 years). The average age of the wards in the digit-span sample was 9 years, while the mean ages for mothers and fathers were 38 years and 45 years. Wards in the academic test sample also had an average age of 13 years, while their mothers and fathers were 38 years and 45 years, respectively.

All three samples have more male wards than female wards. The male wards in all the samples scored higher average marks on all tests than the females. About 20% (12%) of the wards in the digit-span (mathematics and English language) sample were underweight, while the majority were found in the normal BMI range. The underweight category scored the least average marks in all three tests across the two samples, while those in the overweight category scored the highest (28.7% and 64.3%) in both the digit-span and mathematics tests. In the digit-span test sample and the mathematics and English language test sample, 11% and 8% had no textbook, while 43% and 41% had access to all textbooks, respectively. Having access to all textbooks is positively and highly correlated with test scores.

Table 5. 1 Summary Statistics

Variable	Digit-span test sample (N=2,396)			Mathematics test sample (N=1,685)			English language test sample (N=1,548)		
	Mean	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***
Test scores									
Digit span test	28.54	20.33							
Mathematics				64.12	24.41				
English language							49.56	35.48	
Empowerment									
Social empowerment	0.68	0.26		0.68	0.26		0.68	0.26	
Economic empowerment	0.67	0.21		0.67	0.21		0.67	0.21	
Characteristics of wards									
Age of ward	9	3		13	3		13	3	
Years of schooling	3	3		6	3		6	3	
Gender of ward									
Male	0.56	0.50	*23.21*	0.56	0.50	*63.64*	0.56	0.50	*47.40*
Female	0.44	0.50	*22.82*	0.44	0.50	*62.00*	0.44	0.50	*47.15*
BMI status									
Underweight	0.20	0.40	*11.43*	0.12	0.33	*59.41*	0.12	0.33	*43.33*
Normal	0.59	0.49	*26.73*	0.70	0.46	*63.95*	0.70	0.46	*51.36*
Overweight	0.10	0.30	*28.65*	0.11	0.31	*64.26*	0.10	0.31	*47.51*
Obese	0.10	0.31	*23.91*	0.07	0.26	*60.25*	0.08	0.26	*45.32*
Access to textbooks									
All	0.43	0.49	*29.76*	0.41	0.49	*68.01*	0.41	0.49	*55.20*
Some	0.46	0.50	*28.30*	0.51	0.50	*64.14*	0.50	0.50	*50.81*
None	0.11	0.32	*19.92*	0.08	0.28	*55.67*	0.08	0.27	*43.41*

Table 5. 1 Summary Statistics (Continued)

Variable	Digit-span test sample (N=2,396)			Mathematics test sample (N=1,685)			English language test sample (N=1,548)		
	Mean	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***
Characteristics of mothers									
Age of mother	37.86	7.79		38.21	8.39		38.29	8.39	
Mother's height	157.54	17.12		157.76	17.60		157.66	18.01	
Mother's education									
None	0.96	0.20	*22.49*	0.98	0.15	*61.88*	0.97	0.16	*47.41*
Primary	0.01	0.10	*26.30*	0.01	0.08	*66.93*	0.01	0.07	*40.88*
JSS/Middle	0.03	0.16	*30.04*	0.01	0.12	*73.28*	0.01	0.12	*44.01*
Secondary	0.01	0.08	*34.76*	0.00	0.05	*76.66*	0.00	0.08	*52.54*
Higher	0.00	0.05	*37.19*	0.00	0.06	*75.79*	0.00	0.07	*56.18*
Characteristics of fathers									
Age of father	45.39	10.34		45.20	10.72		45.20	10.61	
Father's working hours /week	12.95	23.18		11.96	22.37		12.35	22.61	
Father's height	166.16	19.48		165.73	20.99		165.73	21.41	
Father's education									
None	0.93	0.25	*21.28*	0.96	0.19	*61.33*	0.96	0.19	*42.82*
Primary	0.01	0.10	*22.66*	0.01	0.09	*62.14*	0.01	0.09	*55.60*
JSS/Middle	0.05	0.21	*26.41*	0.03	0.16	*71.01*	0.03	0.16	*66.35*
Secondary	0.00	0.06	*33.14*	0.00	0.04	*71.96*	0.00	0.04	*73.81*
Higher	0.00	0.07	*35.36*	0.00	0.05	*77.02*	0.00	0.04	*79.31*

Table 5. 1 Summary Statistics (Continued)

Variable	Digit-span test sample (N=2,396)			Mathematics test sample (N=1,685)			English language test sample (N=1,548)		
	Mean	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***	**Mean**	**S. D.**	***Av. Score (%)***
Household characteristics									
Household size	5.85	2.05		5.98	2.08		5.97	2.08	
Locality									
Urban	0.44	0.50	*29.95*	0.43	0.50	*71.95*	0.45	0.50	*55.53*
Rural	0.56	0.50	*20.39*	0.57	0.50	*58.19*	0.55	0.50	*42.83*
Real Household Expenditure Quintile									
Lowest	0.10	0.30	*19.93*	0.11	0.31	*58.92*	0.11	0.31	*44.08*
Lower	0.18	0.38	*21.63*	0.17	0.37	*60.61*	0.16	0.37	*45.35*
Middle	0.20	0.40	*22.58*	0.19	0.39	*62.05*	0.19	0.39	*46.64*
Higher	0.25	0.43	*23.74*	0.25	0.43	*63.17*	0.25	0.43	*47.77*
Highest	0.27	0.44	*27.74*	0.29	0.45	*68.65*	0.30	0.46	*52.04*
Region									
Western	0.13	0.33	*23.65*	0.13	0.34	*65.76*	0.13	0.34	*43.77*
Central	0.08	0.28	*22.67*	0.07	0.26	*64.77*	0.07	0.26	*47.24*
Gt Accra	0.13	0.33	*37.76*	0.14	0.34	*76.61*	0.14	0.35	*66.57*
Volta	0.06	0.24	*20.97*	0.06	0.23	*61.21*	0.06	0.23	*45.07*
Eastern	0.08	0.27	*24.93*	0.07	0.26	*63.88*	0.07	0.26	*51.09*
Ashanti	0.21	0.40	*30.05*	0.20	0.40	*72.26*	0.20	0.40	*61.57*
Brong Ahafo	0.09	0.29	*21.01*	0.10	0.30	*63.03*	0.10	0.30	*45.93*
Northern	0.13	0.34	*16.80*	0.13	0.33	*50.99*	0.13	0.33	*36.72*
Upper East	0.07	0.25	*26.15*	0.09	0.28	*70.62*	0.08	0.27	*58.70*
Upper West	0.02	0.17	*29.94*	0.02	0.14	*56.04*	0.02	0.12	*50.63*

Source: Author's computation

Wards between the ages of 5 and 15 who had none of the required textbooks had an average score of 19.9%, while those who had all textbooks scored an average of 29.8% on the digit-span test. The story is similar for the academic achievement test (mathematics test and English language test) samples. Those with access to all textbooks had about 12 marks higher than those with no textbook.

The average fathers' working hours per week for wards in the digit span sample was about 13 hours per week, while that for wards in the mathematics and English language samples was about 12 hours per week. The average height of mothers in all three samples was about 157 centimetres, while the average height of fathers in all three samples was 166 centimetres. In all the samples, wards whose mothers have, at least, primary education scored higher marks than those whose mothers have no education. This is also seen with the father's education, as the wards whose fathers had attained JSS, secondary and higher levels of education scored higher than those whose fathers had no educational attainment.

It can also be seen that there is an expenditure gradient as wards within higher expenditure quintiles score consistently higher marks on all three tests than those in the lower quintiles. Also, wards in urban areas had over 9%, 13% and 12% higher scores than those in the rural areas. More so, wards from the Ashanti Region and the Greater Accra Region had the highest average test scores among all the regions. In contrast, wards within the Northern Region had the lowest average scores on all the tests. This could imply the existence of inequality in educational infrastructure and amenities that foster the quality of learning. Teachers may be selective in accepting postings to more rural and underdeveloped regions which lack basic infrastructures such as electricity, good roads and quality telephone network.

5.3 Regression results and discussion

Tables 5.2, 5.3 and 5.4 present random-effect Tobit regression estimates of maternal empowerment on the digit-span test scores, mathematics test scores and English language test scores, respectively. Women's economic empowerment and women's social empowerment are likely to be highly correlated. Hence, they are used in separate models. Model 1 (second column) shows the effect of women's economic empowerment on the digit-span test scores. In Model 2, the digit-span test scores are regressed on the women's economic empowerment measure sub-components, namely, employment status, access to credit, land ownership status, and savings of a woman. Models 3 and 4, the women's social empowerment index and the index sub-components are used for the estimations.

5.3.1 Maternal empowerment and wards' digit-span test scores.

From model 1 in Table 5.2, a mother's level of social empowerment has a positive and significant effect on the cognitive performance of wards. A unit increase in the social empowerment index results in a 5.6-unit improvement in cognitive scores at 1 percent significance level. This result closely aligns with that of Shroff *et al.* (2009), Bhagowalia *et al.* (2012) and Carlson *et al.* (2015), who found a positive association between social empowerment proxied by freedom of movement and the welfare of wards but contradicts that of Kamiya *et al.* (2018).

Model 2 shows that when the man is not the sole decision-maker and when the husband does not restrict the wife's contact with her family, the cognitive test scores of their wards are respectively 4.5-units and 2.7-units higher, compared to when the man of the house makes important decisions unilaterally and when the husband tried to restrict the wife's contact with her family. This goes to provide some evidence of the positive effect of collaborative decision-making at home. As well, a healthy contact with her family that can provide social support and also aid in socialising wards. The ability to maintain contact with one's family

offers avenues for stress relief and could result in better and improved mood, health and welfare, in general, for mothers. Thus, social empowerment affects the capacity, frequency and quality of mothers' interaction with their wards and supplies the necessary support system conducive to wards' development.

Model 3 shows that a mother's level of economic empowerment has a positive and significant effect on the cognitive performance of wards. A unit increase in the economic empowerment index results in a 4.6-unit improvement in cognitive scores at 1 percent significance level. Model 4 shows that the positive effect of the economic empowerment index is mainly driven by the employment status of a mother and her ability to save. Specifically, wards whose mothers are employed or can save money are likely to have 4-units and 2.6-units higher scores, respectively, than those whose mothers are not employed or do not save.

Table 5. 2 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Digit-span cognitive test scores of wards

VARIABLES	(1) Digit-span	(2) Digit-span	(3) Digit-span	(4) Digit-span
Social empowerment	5.570***			
	(1.679)			
Not acceptable to tolerate beating		-1.269		
		(1.337)		
Family contact not limited by partner		2.674***		
		(0.783)		
Not better to educate a son than a daughter		-1.604		
		(1.934)		
Important decisions not made by only men		4.471***		
		(1.381)		
Partner not always demanding wife's location		2.450		
		(1.906)		
Economic empowerment			4.638***	
			(1.670)	
Mother is employed				3.946***
				(1.167)
Mother owns land				-0.032
				(1.265)
Mother can borrow				-1.587
				(1.000)
Mother has savings				2.579***
				(0.781)
Female	-1.055	-1.009	-1.049	-0.697
	(0.762)	(0.693)	(0.710)	(0.635)
Age of ward	2.459***	2.421***	2.470***	1.844***
	(0.215)	(0.260)	(0.247)	(0.210)
Years of Schooling	2.257***	2.278***	2.223***	2.330***
	(0.308)	(0.331)	(0.307)	(0.267)
Religion (Ref: Christian)				
Muslim	2.403	2.112	2.393	2.333
	(5.823)	(5.733)	(3.539)	(3.689)
Others	0.387	0.372	0.386	0.305
	(2.843)	(2.813)	(2.840)	(2.828)
Nutrition Status (Ref: Underweight)				
2.BMI_Normal	7.983***	8.271***	8.075***	8.067***
	(0.931)	(0.995)	(0.854)	(0.785)
3.BMI_Overweight	12.036***	12.078***	11.885***	11.956***
	(1.646)	(1.409)	(1.597)	(1.401)
4.BMI_Obese	13.859***	14.288***	14.031***	13.628***
	(1.742)	(1.650)	(1.948)	(1.954)
Public School	-1.584*	-1.458*	-1.544*	-1.151
	(0.886)	(0.858)	(0.928)	(0.780)
Access to textbooks (None)				
Has all required textbooks	4.032***	3.912***	4.036***	3.608***
	(1.515)	(1.341)	(1.087)	(1.105)
Has some, but not all	3.480***	3.487***	3.308**	1.923**
	(1.160)	(1.179)	(1.378)	(0.970)
Age of Mother	0.110	0.107	0.105	0.084
	(0.074)	(0.068)	(0.066)	(0.065)

Table 5. 2 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Digit-span cognitive test scores of wards (continued)

VARIABLES	(1) Digit-span	(2) Digit-span	(3) Digit-span	(4) Digit-span
Mother's Education (Ref: None)				
Primary	11.549	13.157*	12.655*	11.250*
	(7.061)	(7.593)	(7.383)	(6.806)
JSS/Middle school	7.935***	7.953***	8.958***	7.658***
	(2.216)	(2.256)	(3.143)	(2.431)
Secondary	2.170	2.395	2.181	1.891
	(2.822)	(2.717)	(3.761)	(2.722)
Higher	16.375	14.684	14.463	13.934
	(25.843)	(35.632)	(25.041)	(9.024)
Mother's height	3.656	3.497	3.369	1.076
	(3.242)	(3.052)	(3.440)	(2.991)
Age of Father	-0.056	-0.065	-0.052	-0.034
	(0.057)	(0.051)	(0.052)	(0.049)
Father's Education (Ref: None)				
Primary	-0.470	-0.339	-0.140	-0.444
	(4.595)	(4.293)	(4.161)	(3.343)
JSS/Middle school	1.463	1.482	1.437	1.958
	(2.469)	(2.425)	(1.790)	(1.910)
Secondary	-7.086	-2.491	-6.470	-5.118
	(6.679)	(7.560)	(9.858)	(4.884)
Higher	5.190	4.462	4.528	2.150
	(7.245)	(7.121)	(6.757)	(5.415)
Father's working hours	0.029	0.022	0.028	0.019
	(0.020)	(0.020)	(0.018)	(0.018)
Father's height	3.819	2.113	2.560	2.769
	(3.821)	(3.683)	(3.732)	(3.296)
Household size	-0.227	-0.277	-0.287	-0.279*
	(0.153)	(0.172)	(0.177)	(0.162)
Rural	-3.025***	-3.135***	-3.197***	-3.388***
	(0.951)	(1.106)	(1.130)	(0.864)
Household expenditure quintile (Ref: Lowest)				
Lower	4.000***	3.882**	3.852**	3.325***
	(1.314)	(1.520)	(1.678)	(1.283)
Middle	3.505***	3.019*	3.253**	3.502***
	(1.245)	(1.682)	(1.603)	(1.259)
Higher	4.742***	4.330***	4.298***	4.311***
	(1.338)	(1.522)	(1.561)	(1.292)
Highest	1.995	1.371	1.521	2.019
	(1.459)	(1.773)	(1.851)	(1.359)
Region (Ref: Greater Accra Region)				
Western Region	-8.548***	-7.964***	-8.061***	-7.424***
	(1.965)	(2.058)	(2.001)	(1.881)
Central Region	-8.074***	-8.206***	-8.238***	-7.720***
	(2.475)	(2.366)	(1.906)	(2.066)
Volta Region	-10.833***	-11.668***	-11.011***	-11.219***
	(2.364)	(2.376)	(2.057)	(2.078)
Eastern Region	-10.606***	-10.593***	-10.502***	-9.643***
	(2.132)	(1.988)	(1.849)	(1.884)
Ashanti Region	-6.402***	-6.984***	-6.671***	-6.344***
	(2.006)	(1.973)	(1.704)	(1.802)
Brong Ahafo Region	-10.598***	-10.513***	-10.281***	-10.140***
	(2.200)	(2.353)	(1.764)	(1.873)

Table 5. 2 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Digit-span cognitive test scores of wards (continued)

VARIABLES	(1) Digit-span	(2) Digit-span	(3) Digit-span	(4) Digit-span
Northern Region	-8.788***	-8.760***	-9.107***	-8.240***
	(2.251)	(2.191)	(2.024)	(2.002)
Upper East Region	-5.180**	-5.769**	-5.486***	-4.577**
	(2.294)	(2.565)	(2.051)	(2.103)
Upper West Region	3.819	2.113	2.560	2.769
	(3.821)	(3.683)	(3.732)	(3.296)
Constant	-8.589	-16.301**	-8.267*	7.958*
	(5.691)	(7.035)	(4.644)	(4.124)
Time effects	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes
Observations	2,394	2,394	2,396	2,391
Likelihood-ratio (LR) test	406	578	402	456
Prob > chi2	0.000	0.000	0.000	0.000
Wald (χ 2)	2203	2021	1789	1845
Prob > chi2	0.000	0.000	0.000	0.000
Rho	0.555	0.574	0.412	0.440
Hausman test (prob)	0.247		0.742	

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
All models are estimated with random-effect Tobit estimation technique.

Table 5.3 presents separate estimates for the forward digit-span test and backward digit-span test. This is necessary as the literature shows that the backward digit-span test measures the working memory. In contrast, the forward alone or a combination of both the forward and backward digit-span tests examine the respondent ward's short-term memory. The effects of women's social and economic empowerment on the forward digit-span test scores are greater than the effects on the backward digit-span test scores. At the same time, the signs are consistent with the signs of the main estimations.

Table 5. 3 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the forward and backwards Digit-span cognitive test scores of wards

VARIABLES	(1) Forward DS	(2) Backward DS	(3) Forward DS	(4) Backward DS
Economic empowerment	6.584***	1.383***		
	(2.280)	(0.296)		
Social empowerment			5.902***	1.912
			(2.229)	(2.740)
Female	-0.726	0.633	-0.734	0.664
	(1.547)	(1.443)	(1.723)	(1.288)
Age of ward	0.995**	1.058***	0.998**	1.048***
	(0.400)	(0.335)	(0.426)	(0.340)
Years of Schooling	-0.044	2.510***	-0.045	2.488***
	(0.523)	(0.459)	(0.561)	(0.365)
Religion (Ref: Christian)				
Muslim	-0.023	-0.045	-0.021	-0.044
	(0.044)	(0.044)	(0.059)	(0.054)
Others	-9.676	-1.401	-8.432	-1.120
	(7.470)	(8.856)	(7.707)	(6.394)
Nutrition Status (Ref: Underweight)				
2.BMI_Normal	18.968***	7.327***	18.941***	7.403***
	(2.432)	(2.072)	(3.045)	(1.651)
3.BMI_Overweight	25.177***	14.614***	25.531***	14.832***
	(3.275)	(2.975)	(4.018)	(2.526)
4.BMI_Obese	13.633***	8.114***	13.485***	8.141***
	(2.917)	(2.850)	(3.679)	(2.841)
Public School	-1.843	-3.381**	-1.874	-3.374**
	(1.671)	(1.585)	(1.546)	(1.501)
Access to textbooks (Ref: None)				
Has all required textbooks	5.670*	3.986*	5.730*	4.035*
	(2.914)	(2.078)	(2.985)	(2.191)
Has some, but not all	6.792**	4.628**	6.902**	4.793**
	(2.684)	(1.799)	(2.869)	(2.121)
Age of Mother	0.047	0.129	0.038	0.142
	(0.137)	(0.123)	(0.155)	(0.101)
Mother's Education (Ref: None)				
Primary	22.449	24.682*	21.154	24.214**
	(15.339)	(14.217)	(14.616)	(12.272)
JSS/Middle school	-7.373	-4.210	-7.232	-4.251
	(5.881)	(5.671)	(7.835)	(5.983)
Secondary	-3.463	2.511	-4.289	2.598
	(8.762)	(3.635)	(12.943)	(7.872)
Higher	8.140	2.513	6.484	3.058
	(9.464)	(5.899)	(7.722)	(5.023)
Mother's height	0.069	0.072	0.068	0.070
	(0.091)	(0.065)	(0.096)	(0.070)
Age of Father	0.045	0.089	0.043	0.098
	(0.101)	(0.090)	(0.126)	(0.074)

Table 5. 3 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the forward and backwards Digit-span cognitive test scores of wards (continued)

VARIABLES	(1) Forward DS	(2) Backward DS	(3) Forward DS	(4) Backward DS
Father's Education (Ref: None)				
Primary	-4.209	-1.165	-4.748	-1.406
	(8.254)	(5.620)	(9.488)	(7.633)
JSS/Middle school	1.237	-2.234	1.144	-2.057
	(6.184)	(3.483)	(4.713)	(3.850)
Secondary	-9.229	-2.266	-9.800	-2.597
	(16.992)	(5.893)	(16.930)	(5.980)
Higher	-0.278	-2.764	0.336	-2.634
	(4.812)	(3.316)	(2.175)	(4.026)
Father's working hours	0.025	-0.008	0.025	-0.007
	(0.042)	(0.027)	(0.035)	(0.031)
Father's height	9.676	11.401	8.432	1.120
	(7.470)	(8.856)	(7.707)	(5.394)
Household size	-0.086	0.279	-0.038	0.268
	(0.386)	(0.333)	(0.339)	(0.290)
Rural	-2.459	-4.130***	-2.285	-3.940**
	(1.932)	(1.305)	(2.840)	(1.598)
Household expenditure quintile (Ref: Lowest)				
Lower	3.854	4.489*	4.117	4.632*
	(2.738)	(2.725)	(2.942)	(2.597)
Middle	0.799	4.164	1.138	4.234*
	(2.558)	(2.689)	(3.013)	(2.315)
Higher	2.937	3.820	3.454	3.911*
	(2.519)	(2.764)	(2.802)	(2.232)
Highest	2.188	1.923	1.572	2.101
	(3.061)	(2.512)	(3.189)	(2.154)
Region (Ref: Greater Accra Region)				
Western Region	-8.548***	-7.964***	-8.061***	-7.424***
	(1.965)	(2.058)	(2.001)	(1.881)
Central Region	-8.074***	-8.206***	-8.238***	-7.720***
	(2.475)	(2.366)	(1.906)	(2.066)
Volta Region	-10.833***	-11.668***	-11.011***	-11.219***
	(2.364)	(2.376)	(2.057)	(2.078)
Eastern Region	-10.606***	-10.593***	-10.502***	-9.643***
	(2.132)	(1.988)	(1.849)	(1.884)
Ashanti Region	-6.402***	-6.984***	-6.671***	-6.344***
	(2.006)	(1.973)	(1.704)	(1.802)
Brong Ahafo Region	-10.598***	-10.513***	-10.281***	-10.140***
	(2.200)	(2.353)	(1.764)	(1.873)
Northern Region	-8.409*	-12.464***	-7.990**	-12.269***
	(4.372)	(3.216)	(3.680)	(4.135)
Upper East Region	-6.682	-12.044***	-6.368	-12.034***
	(4.428)	(3.165)	(4.495)	(4.136)
Upper West Region	0.453	-0.256	1.947	0.233
	(6.110)	(4.663)	(6.820)	(5.540)

Table 5. 3 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the forward and backwards Digit-span cognitive test scores of wards (continued)

VARIABLES	(1) Forward DS	(2) Backward DS	(3) Forward DS	(4) Backward DS
Constant	24.869**	16.333*	26.466**	18.459*
	(11.563)	(8.482)	(12.417)	(11.084)
Time effects	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes
Observations	2,768	2,768	2,766	2,766
Likelihood-ratio (LR) test	1257	1355	1321	1304
Prob > chi2	0.000	0.000	0.000	0.000
Wald (χ 2)	606	1223	1215	909
Prob > chi2	0.000	0.000	0.000	0.000
Observations	0.277	0.250	0.431	0.442

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
All models are estimated with random-effect Tobit estimation technique.

5.3.2 Maternal empowerment and wards' mathematics test scores.

Table 5.4 presents the results from random-effect and Tobit regressions for the mathematics test scores. Model 1 (second column) shows the random-effect Tobit regression model results with the composite social empowerment measure; model 2 (column 3) presents the random-effect Tobit regression results with the individual elements of the social empowerment measure. Similarly, models 3 and 4 (columns 4 and 5), respectively, consider the effect of the composite economic empowerment measure and the items used to compute the measure.

From model 1, a unit increase in the social empowerment index results in a 7.5-unit improvement in mathematics test scores at 1 percent significance level. This result confirms that of Shroff *et al.* (2009) and Gebremedhin and Mohanty (2016), who found that maternal autonomy in decision-making and movement enhance wards' outcomes, including schooling outcomes. Model 2 shows that social empowerment's positive effect is mainly driven by the mother maintaining unrestricted contact with her family, decision-making participation, and the absence of any compulsion to disclose her location. Family backing provides a vital source of support in diverse ways, affecting the quality of wards' learning. Gebremedhin and

Mohanty (2016) noted that having autonomy of movement makes it easy for women to engage in gainful work activities and, therefore, enhances their bargaining power and contribution to household resource allocation. Autonomy in movement can, thus, enhance the schooling of her wards.

Model 3 also shows that mothers' level of economic empowerment has a positive and significant effect on the mathematics test scores of their wards. Respectively, a unit increase in the economic empowerment index results in a 3.5-unit improvement in mathematics test scores at 1 percent significance level. This result is aligned with that of Zhan and Sherraden (2003), Rubalcava *et al*. (2009), Nam and Huang (2009) and Luz and Agadjanian (2015). They found that the economic empowerment of women significantly affects wards' learning outcomes. Model 4 shows that the positive effect of the economic empowerment index is mainly driven by the employment status of a mother and her ability to save. Specifically, wards whose mothers are employed or can save money are likely to have 3.8-units and 3.5-units higher scores, respectively, compared to those whose mothers are not employed or do not save.

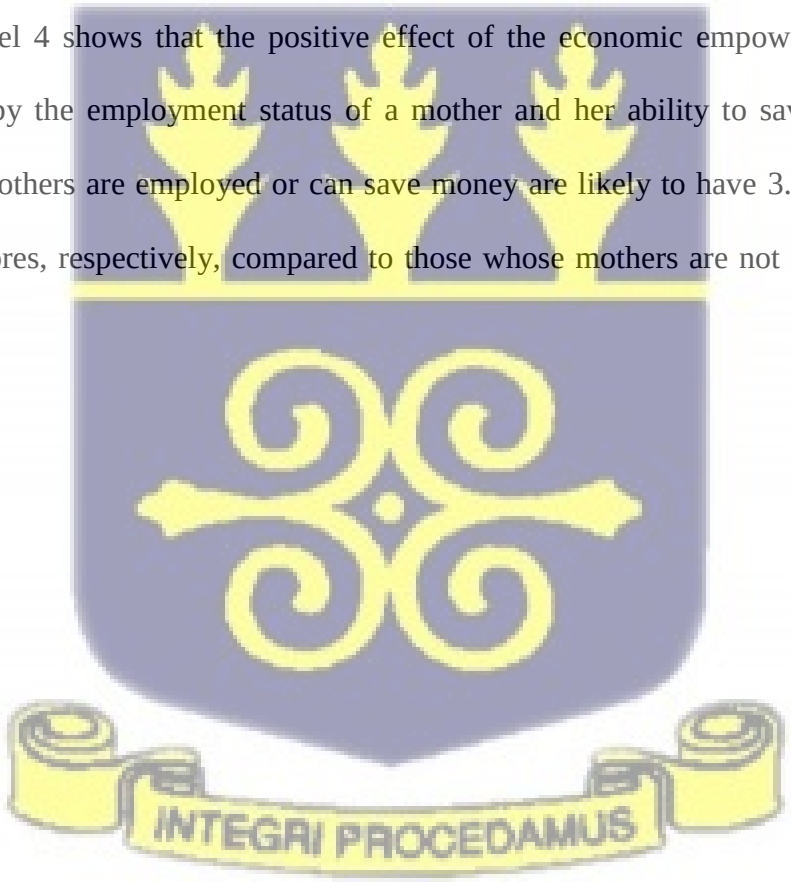

Table 5. 4 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Mathematics test scores of wards

VARIABLES	(1) Math	(2) Math	(3) Math	(4) Math
Social empowerment	7.528***			
	(1.852)			
Not acceptable to tolerate beating		1.715		
		(1.588)		
Family contact not limited by partner		0.554**		
		(0.266)		
Not better to educate a son than a daughter		1.304		
		(1.112)		
Important decisions not made by only men		4.778**		
		(2.263)		
Partner not always demanding wife's location		3.747***		
		(1.152)		
Economic empowerment			3.451**	
			(1.669)	
Mother is employed				3.805***
				(1.237)
Mother owns land				1.078
				(1.984)
Mother can borrow				-0.676
				(1.693)
Mother has savings				3.476***
				(1.143)
Female	-2.407**	-2.343**	-2.473**	-2.278**
	(1.182)	(1.021)	(1.130)	(1.012)
Age of ward	-0.125	-0.153	-0.111	-0.205
	(0.353)	(0.282)	(0.277)	(0.283)
Years of Schooling	4.431***	4.373***	4.429***	4.429***
	(0.449)	(0.347)	(0.321)	(0.346)
Religion (Ref: Christian)				
Muslim	-3.759	-3.243	-3.403	-3.403
	(4.749)	(5.556)	(5.823)	(5.823)
Others	0.889	0.798	0.853	0.853
	(1.543)	(1.225)	(1.744)	(1.744)
Nutrition Status (Ref: Underweight)				
2.BMI_Normal	1.242	1.817	1.298	1.159
	(1.900)	(1.416)	(1.398)	(1.401)
3.BMI_Overweight	1.746	1.541	1.379	1.273
	(2.904)	(2.091)	(2.175)	(2.097)
4.BMI_Obese	2.848	3.834	3.061	3.758
	(4.471)	(2.970)	(3.530)	(2.994)
Public School	-5.507***	-5.342***	-5.462***	-5.645***
	(1.575)	(1.312)	(1.635)	(1.305)
Access to textbooks (Ref: None)				
Has all required textbooks	3.252	1.932	3.107	3.019
	(2.548)	(2.090)	(1.956)	(2.076)
Has some, but not all	1.751	0.638	1.451	1.622
	(2.663)	(2.013)	(1.847)	(2.006)
Age of Mother	0.049	0.069	0.048	0.074
	(0.103)	(0.082)	(0.109)	(0.084)

Table 5.4 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Mathematics test scores of wards (continued)

VARIABLES	(1) Math	(2) Math	(3) Math	(4) Math
Mother's Education (Ref: None)				
Primary	8.642	9.981	9.582	9.010
	(10.536)	(9.131)	(11.975)	(9.205)
JSS/Middle school	13.545**	9.892***	14.116***	8.094***
	(5.500)	(2.867)	(4.489)	(2.904)
Secondary	19.564*	15.231	18.369	15.240*
	(11.376)	(9.652)	(45.360)	(9.253)
Higher	7.794	-1.222	4.719	-3.823
	(57.990)	(14.166)	(44.672)	(14.377)
Mother's height	8.827**	8.458***	8.768***	9.112***
	(4.141)	(3.222)	(3.379)	(3.259)
Age of Father	-0.053	-0.043	-0.054	-0.055
	(0.074)	(0.063)	(0.057)	(0.065)
Father's Education (Ref: None)				
Primary	14.130***	10.528***	13.935***	10.299***
	(3.729)	(2.604)	(4.139)	(2.683)
JSS/Middle school	14.922**	12.275**	14.046*	11.850**
	(6.275)	(6.143)	(7.630)	(5.942)
Secondary	14.728***	16.790***	13.342***	13.057***
	(3.821)	(3.439)	(2.510)	(2.437)
Higher	-1.959	-0.696	-2.690	-1.261
	(14.804)	(10.521)	(11.588)	(11.445)
Father's working hours	-0.044	-0.045*	-0.045	-0.033
	(0.034)	(0.026)	(0.031)	(0.026)
Father's height	5.686	4.100	3.894	4.574
	(4.350)	(3.615)	(4.093)	(3.667)
Household size	-0.296	-0.209	-0.348	-0.289
	(0.272)	(0.245)	(0.419)	(0.249)
Rural	-5.594***	-5.624***	-6.042***	-5.356***
	(1.228)	(1.313)	(1.451)	(1.314)
Household expenditure quintile (Ref: Lowest)				
Lower	-1.559	-1.198	-1.387	-1.664
	(1.655)	(1.926)	(2.037)	(1.946)
Middle	2.060	1.702	2.571	1.871
	(1.522)	(1.850)	(2.037)	(1.854)
Higher	2.684	2.025	3.068	2.571
	(1.782)	(1.944)	(2.393)	(1.945)
Highest	3.418**	3.960**	4.121**	3.630**
	(1.687)	(1.917)	(2.039)	(1.638)
Region (Ref: Greater Accra Region)				
Western Region	-3.849	-2.212	-3.390	-1.928
	(2.977)	(2.494)	(3.255)	(2.509)
Central Region	-4.577	-3.493	-4.322	-3.548
	(3.480)	(3.010)	(3.817)	(2.991)
Volta Region	-0.103	0.075	-0.164	-0.321
	(3.597)	(3.069)	(4.221)	(3.050)
Eastern Region	-3.346	-1.524	-3.023	-1.830
	(2.297)	(2.513)	(2.714)	(2.494)
Ashanti Region	2.629	3.590*	2.428	3.546
	(3.041)	(2.182)	(2.817)	(2.165)

Table 5.4 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the Mathematics test scores of wards (continued)

	(1)	(2)	(3)	(4)
VARIABLES	Math	Math	Math	Math
Brong Ahafo Region	0.563	0.712	0.750	0.860
	(3.031)	(2.520)	(3.356)	(2.472)
Northern Region	-0.723	-0.486	-1.319	-0.887
	(2.779)	(2.413)	(3.303)	(2.385)
Upper East Region	9.525***	8.233***	9.356**	8.559***
	(3.617)	(2.592)	(3.838)	(2.641)
Upper West Region	5.686	4.100	3.894	4.574
	(4.350)	(3.615)	(4.093)	(3.667)
Constant	31.500***	25.342***	34.220***	37.179***
	(6.858)	(8.663)	(7.120)	(6.112)
Time effects	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes
Observations	1,685	1,663	1,685	1,684
Likelihood-ratio (LR) test	664	703	817	852
Prob > chi2	0	0	0	0
Wald (χ 2)	2553	2674	2344	2449
Prob > chi2	0	0	0	0
Rho	0.412	0.533	0.591	0.577
Hausman test (prob)	0.166		0.732	

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
All models are estimated with random-effect Tobit estimation technique

5.3.3 Maternal empowerment and wards' English language test scores.

From model 1 of Table 5.5, the mother's economic empowerment has a positive and significant effect on the wards' academic achievement as a unit increase in the women's social empowerment index results in a 3.6-unit reduction in English language test scores at 1 percent significance level. In trying to find out how the various items used to compute the women's social empowerment index affect the English language test score, the English test score is regressed on the employment status, land ownership status, access to credit and savings of women. Wards whose mothers are employed, own at least a piece of land, or can save money are likely to have 5.5-units, 6-units or 4.9-units higher English language test scores, respectively, compared to those whose mothers are not employed, do not own land or

Table 5. 5 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the English Language test scores of wards

VARIABLES	(1) English	(2) English	(3) English	(4) English
Social empowerment	3.656			
	(3.022)			
Not acceptable to tolerate beating		2.333		
		(1.880)		
Family contact not limited by partner		3.279		
		(2.448)		
Not better to educate a son than a daughter		3.981		
		(2.958)		
Important decisions not made by only men		1.784		
		(2.038)		
Partner not always demanding wife's location		2.515		
		(2.352)		
Economic empowerment			3.631***	
			(1.347)	
Mother is employed				5.514**
				(2.490)
Mother owns land				5.957**
				(3.001)
Mother can borrow				-6.191
				(5.582)
Mother has savings				4.896***
				(1.236)
Female	1.205	0.159	1.112	0.664
	(1.687)	(1.228)	(1.394)	(1.246)
Age of ward	-1.177***	-0.669**	-1.167***	-0.670**
	(0.413)	(0.332)	(0.337)	(0.332)
Years of Schooling	6.958***	5.224***	6.951***	5.226***
	(0.418)	(0.387)	(0.460)	(0.393)
Religion (Ref: Christian)				
Muslim	-5.564	-6.498	-6.272	-6.427
	(8.134)	(8.344)	(8.348)	(8.332)
Others	-3.101	-3.665	-3.236	-3.843
	(4.279)	(4.144)	(4.945)	(4.839)
Nutrition Status (Ref: Underweight)				
2.BMI_Normal	4.545	2.035	4.488*	1.348
	(2.973)	(1.940)	(2.665)	(1.944)
3.BMI_Overweight	7.235*	4.141	6.878*	3.710
	(4.492)	(2.533)	(4.003)	(2.512)
4.BMI_Obese	-1.695	1.272	-1.683	-1.419
	(4.161)	(3.594)	(4.538)	(3.625)
Public School	-8.099***	-7.116***	-8.208***	-6.715***
	(2.019)	(1.655)	(1.923)	(1.627)
Access to textbooks (Ref: None)				
Has all required textbooks	7.932***	7.856*	8.049***	7.961*
	(2.346)	(2.560)	(2.745)	(2.589)
Has some, but not all	3.131	1.784	3.513	1.556
	(2.376)	(2.454)	(2.194)	(2.459)
Age of Mother	0.153	0.157	0.150	0.134
	(0.116)	(0.101)	(0.131)	(0.101)

Table 5. 5 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the English Language test scores of wards (continued)

VARIABLES	(1) English	(2) English	(3) English	(4) English
Mother's Education (Ref: None)				
Primary	10.003	2.601	10.680	1.412
	(34.622)	(3.337)	(29.236)	(4.724)
JSS/Middle school	8.936***	10.886***	9.555***	9.999***
	(2.603)	(3.413)	(3.016)	(3.450)
Secondary	2.252	0.792	2.581	1.089
	(11.106)	(8.282)	(13.260)	(7.792)
Higher	6.649	4.874	5.379	4.171
	(5.637)	(5.283)	(6.647)	(5.349)
Mother's height	2.413	3.515	1.925	3.281
	(4.295)	(4.179)	(6.080)	(4.109)
Age of Father	-0.114	-0.094	-0.112	-0.051
	(0.082)	(0.079)	(0.109)	(0.080)
Father's Education (Ref: None)				
Primary	7.742**	6.448**	8.988**	5.623**
	(3.530)	(2.939)	(4.452)	(2.825)
JSS/Middle school	2.615	2.386	2.903	2.380
	(5.187)	(2.929)	(2.827)	(2.982)
Secondary	7.346	3.206	6.673	3.771
	(26.614)	(18.519)	(24.439)	(4.040)
Higher	13.748***	12.854***	13.429***	16.022***
	(4.254)	(2.262)	(3.413)	(2.203)
Father's working hours	-0.049	-0.026	-0.046	-0.032
	(0.044)	(0.030)	(0.042)	(0.031)
Father's height	4.364***	3.206***	6.783***	7.348***
	(1.145)	(1.019)	(2.232)	(2.857)
Household size	0.089	0.289	0.118	0.509*
	(0.468)	(0.284)	(0.297)	(0.284)
Household expenditure quintile (Ref: Lowest)				
Lower	4.135	5.050**	4.013*	4.996**
	(2.859)	(2.139)	(2.412)	(2.146)
Middle	1.224	-0.937	1.071	-0.758
	(2.576)	(2.121)	(2.352)	(2.142)
Higher	0.333	0.642	0.272	2.149
	(3.146)	(2.085)	(3.193)	(2.100)
Highest	1.261	2.505	1.210	3.869*
	(2.608)	(2.131)	(2.738)	(2.146)
Region (Ref: Greater Accra Region)				
Western Region	-8.723**	-5.798**	-8.513**	-6.980**
	(3.747)	(2.699)	(3.500)	(2.722)
Central Region	-4.123	-3.219	-3.965	-4.445
	(3.098)	(3.289)	(4.642)	(3.313)
Volta Region	-10.742***	-7.563**	-10.703***	-7.872**
	(3.625)	(3.136)	(3.073)	(3.221)
Eastern Region	-10.261**	-7.039**	-10.227***	-7.467**
	(3.991)	(3.066)	(3.367)	(3.072)
Ashanti Region	-2.821	-2.601	-2.627	-3.058
	(3.556)	(2.376)	(3.649)	(2.393)

Table 5. 5 Panel Tobit regression estimates of the effect of women's economic and social empowerment on the English Language test scores of wards (continued)

	(1)	(2)	(3)	(4)
VARIABLES	English	English	English	English
Brong Ahafo Region	-12.020***	-9.614***	-11.417***	-11.470***
	(3.301)	(2.915)	(3.599)	(2.935)
Northern Region	-8.131***	-8.043***	-7.721***	-7.277***
	(3.106)	(2.606)	(2.798)	(2.625)
Upper East Region	9.565**	4.333	9.560**	6.303**
	(4.287)	(3.002)	(3.947)	(2.917)
Upper West Region	3.027	0.470	3.734	1.134
	(6.888)	(4.327)	(6.846)	(4.293)
Rural	-13.449***	-9.971***	-13.211***	-10.745***
	(2.349)	(1.603)	(1.554)	(1.618)
Constant	9.512	10.472	3.444	-13.580
	(11.038)	(7.455)	(12.388)	(11.050)
Time effects	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes
Observations	1,584	1,583	1,584	1,563
Likelihood-ratio (LR) test	157	230	186	212
Prob > chi2	0.001	0.000	0.000	0.000
Wald (χ 2)	1736	1798	1835	2001
Prob > chi2	0.000	0.000	0.000	0.000
Rho	0.544	0.575	0.376	0.411
Hausman test (prob)	0.574		0.668	

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
All models are estimated with random-effect Tobit estimation technique

do not save. This result echoes the findings of Rubalcava *et al.* (2009) and Luz and Agadjanian (2015), who found that women's economic empowerment significantly affects the learning outcomes of wards.

5.3.4 Cognitive development, schooling achievement and covariates

Following the main independent variables discussed in sections 5.3.1, 5.3.2 and 5.3.3, this section discusses the other independent variables used in the estimations shown in Table 5.2. 5.4 and 5.5. This section begins with a discussion of the characteristics of the respondents or wards used in the study. The results show that females tend to score about 2.3 to 2.5 units lower in mathematics at the 5 percent level than males (see Table 5.4). The result contradicts that of Peek-Asa *et al.* (2007), who found higher test scores for females, and Upadhayay and Guragin (2014) found no difference between males' and females' test scores. Such differences have been attributed to stereotype threats that may engender fear of failure (Steele, 1997), anxiety (Osborne, 2001) and negative expectations (Cadinu *et al*., 2005). Gender had no significant effect on other test scores. It is shown in Table 5.2 that a unit increase in age boosts the digit span cognitive test scores of wards by a magnitude ranging between 1.8 and 2.5 units, thus, confirming the results from Ahun *et al.* (2017) and Burleson (2009). Older wards are expected to have more years of education than younger ones. A unit increase in age is also associated with a 0.7 to 1.2 units reduction in the English test scores, thus, corroborating the findings of Peek-Asa *et al.* (2007), who found higher test scores for children below thirteen years of age when compared to those who were thirteen years and above (see Table 5.5).

Years of schooling has a positive and significant effect on all the test scores at 1 percent level. As shown in Table 5.2 and Table 5.4, an additional year of schooling yields about a 2.3-units increase in the digit span test and is also associated with a 4.4-units increase in the mathematics test scores. Similarly, the magnitude of effect for the English language test scores ranges between 5.2 units and 7 units (see Table 5.5). This confirms the work of Parisi *et al.* (2012), which revealed that cognitive development and academic achievement in adulthood might be reflected by consistent engagement with complex cognitive activities such as spending more years in school.

Regarding nutritional status proxied by the weight-for-height (BMI), the results show that wards who have normal weight score 8-units higher on the digit span cognitive test than their underweight counterparts. Similarly, overweight (obese) wards score about 12-units (14-units) higher than the underweight wards. This affirms the crucial effect of the nutritional status of children on their cognitive performance (Ahun *et al*., 2017; Chowdhury & Ghosh, 2010; Freeman *et al*., 1980; Li *et al*., 2008).

Attending a public school makes a difference in mathematics and English language test scores (see Table 5.4 and Table 5.5). Public school attendants have between 5.3-units and 5.6-units lower scores on the mathematics test than those attending private schools. Also, public school attendants scored between 6.7-units and 8.2-units with lower scores on the English language test scores. This signifies, on average, higher academic achievement among wards who attend private schools as opposed to public schools. As expected, the degree of access to textbooks significantly affects wards' digit-span cognitive test scores and English language test scores (see Table 5.2 and Table 5.5). While wards with access to some but not all textbooks have between 1.9-units and 3.5-units higher digit-span test scores than those with no textbooks, wards with all textbooks scored between 3.6-units to 4-units higher on the digit-span test at 1 percent level of significance. Likewise, having access to all textbooks, compared to having none, was is associated with higher English language test scores. Access to all required textbooks is also associated with English language test scores by 8-units higher scores at the 1 percent significance level than wards with no textbooks. Having all textbooks signify a high level of parental investment in wards' education and is, thus, logically expected to reflect higher cognitive development and academic performance.

Turning the focus on to maternal characteristics, it can be seen that compared to wards whose mothers had no education, those whose mothers have completed JSS or middle school recorded between 7.7-units to 9-units higher digit span test scores at 1 percent significance

level (see Table 5.2). Also, wards whose mothers had JSS or middle school as their highest level of education completed have between 8.1-units and 14.1-units higher scores (9-units and 10.9-units higher scores) in mathematics (English language) test, compared to those whose parents have no education. This shows that mothers' attainment of primary and secondary school education is crucial for wards' cognitive development and academic performance. The positive effect could signify increased employability and earnings, which can be invested in child welfare. It also signifies the improved quality of mother-child interactions found in Moore and Snyder (1991) and Schady (2011). Mothers with some average education can provide their wards with some essential assistance regarding their take-home assignments.

Fathers' characteristics were also controlled for in all estimations. Compared to wards whose fathers had no education, the results show that those whose fathers have completed primary education scored between 10.3-units and 14.1-units higher on the mathematics test at 5 percent significance level as well as between 5.6-units and 9-units higher on the English language test at 5 percent significance level (see Table 5.4 and Table 5.5). Similarly, at 5 percent level of significance, wards whose fathers had secondary school (JSS or middle school) as their highest level of education completed scored between 13.1-units and 16.8-units (11.9-units and 14.9-units) higher scores on the mathematics test (See Table 5.4). Compared to wards whose fathers had no education, the results show that those whose fathers have completed higher levels of education scored between 12.9-units and 16-units higher on the mathematics test at 5 percent significance level. These results confirm that of Tamis-LeMonda *et al.* (2004) and Hermida *et al.* (2019), who found that father's completed education level is positively associated with their children's cognitive development.

More so, fathers' working hours significantly affects the academic performance of their wards. The results from Table 5.4 show that a unit increase in the number of working hours

of a father is associated with an increase in the English language test scores at the 1 percent significance level, with the magnitude of the effect ranging between 3.2 units and 7.3 units. One possible reason for this is that working more hours implies an increased labour supply. This is likely to raise earnings and make more funds available for investment in their wards' welfare. This result also corroborates that of Baker (2016), who provided the alternate explanation that when fathers work for many hours, mothers make up for the deficit by reducing their work hours and being available for their wards and spending more quality time engaging in healthy mother-child interaction.

Wards living in rural areas are associated with reduced cognitive development and academic achievement per all three test scores. A unit increase in household size reduces the digit-span test scores of wards by a magnitude ranging between 3 and 3.4 units. Also, a unit increase in household size leads to a 5.4-units to 6-units reduction (10-units to 13.4-units reduction) in the mathematics (English language) test scores at 1 percent significance level. The level of household expenditure also plays a part in the cognitive development and academic performance of wards. The results indicate that compared to wards whose households fall within the first real expenditure quintile, those within the lower, middle, and higher expenditure quintiles have higher digit-span test scores.

Furthermore, compared to wards whose households were identified in the lowest or first real expenditure quintile, households in the second expenditure quintile are associated with about 5-units higher English language test scores. This confirms that households within higher real expenditure quintiles are more likely to spend more on wards' welfare than those in the lower quintiles. Wards who live in rural areas of the country are also associated with 3-units and 11.6-units lower cognitive test scores and English language test scores, respectively, compared to wards who live in urban areas.

5.3.5 Effect of women's economic and social empowerment on the cognitive development and academic performance of wards for different age categories

This section examines whether the effect of women's empowerment on the cognitive development of wards differs for wards of different ages. In order to examine how the empowerment status of a mother affects the quality of learning of her ward, the empirical model is estimated for different age categories. The United Nations Educational, Scientific and Cultural Organization (UNESCO) recommends three levels of detail in categorizing individuals into age groups when studying educational attainment or school enrolment (UNESCO, 1982)[17]. The first level of detail is categorisation into single years for ages 2-24, followed by 5-year groups for older persons. The second level of detail is 3-year-groups for children who are 2-4 years old, 5-year groups for persons who are 5-24 years old, and 10-year groups for older persons. The third level of detail constitutes the grouping of the population into the ages 2-14, 15-24, 25-44, 45-64 and 65+. However, this study categorizes wards into age categories by considering the average ages in the various educational levels in Ghana. As such, the categories for the digit-span test are 5-8 years (lower primary), 9-11 years (upper primary) and 12-15 years (junior secondary school/junior high school).

Similarly, the categories for the mathematics and English language tests are 9-11 years (upper primary), 12-14 years (Junior secondary school), 15-17 years (Senior secondary school/senior high school) and 18 years and above (tertiary education). Panel Tobit estimations are employed in all the estimations. The first three columns in Table 5.6 present the coefficients of the economic empowerment measure, while the following three columns show the estimates of the social empowerment measure.

It can be observed that while the effect of the economic empowerment of women is more remarkable for the younger samples or age categories, the effect of having social norms that empower women enhances the cognitive performance of wards within the older category.

[17] The basis for the UNESCO suggested age categorisation is the average ages at the various grades.

This could imply the necessity of investment into more learning inputs for younger wards as the cognitive performance of older wards are more synonymous with the social norms that enhance the agency of mothers.

Table 5. 6 Women's empowerment and Digit-span test scores by age group

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	5-8 years	9-11 years	12-15 years	5-8 years	9-11 years	12-15 years
Economic empowerment	5.903***	2.500***	2.457			
	(2.145)	(0.593)	(3.074)			
Social empowerment				2.710	2.971***	10.150***
				(2.394)	(0.606)	(2.758)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes	Yes	Yes
Observations	793	649	664	791	649	664
Likelihood-ratio (LR) test	243	302	265	272	318	303
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
Wald (χ 2)	1244	807	1156	902	513	743
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
Rho	0.4	0.352	0.366	0.378	0.278	0.3

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
All models are estimated with random-effect Tobit estimation technique

Table 5.7 and Table 5.8 show different estimates of the effect of women's empowerment on the academic achievement of wards (mathematics test and English language test scores, respectively) for different age categories.

The results show that a unit increase in the economic empowerment measure results in a 6.6-units (6.2-units) increase in the mathematics test scores for wards aged 9 to 11 (12 to 14) years old at the 1 percent level of significance. For wards aged 15 to 17, the magnitude of the effect is smaller but significant at the 5 percent level, while that of adult wards was marginally significant. This shows that women's economic empowerment has a more substantial effect on the academic performance of younger wards compared to older wards. A similar effect is found for the social empowerment of mothers as a unit increase in the measure of social empowerment leads to an 8-units (a 7.4-units) improvement in the

mathematics test scores for wards aged 9 to 11 (12 to 14) years old. These findings suggest that both the economic and social empowerment of women are most impactful on the academic achievement of younger wards.

Table 5. 7 Women's empowerment and mathematics test scores by age group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	9-11 years	12-14 years	15-17 years	18+	9-11 years	12-14 years	15-17 years	18+
Economic empowerment	5.651***	6.168***	2.839**	3.905*				
	(1.606)	(2.268)	(1.350)	(2.273)				
Social empowerment					7.989***	7.411***	5.929	3.426
					(2.315)	(2.439)	(3.862)	(5.681)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	486	508	475	479	486	508	475	479
Likelihood-ratio (LR) test	121	144	113	99	156	132	117	212
Prob > chi2	0.001	0.000	0.001	0.002	0.000	0.000	0.001	0.000
Wald (χ 2)	445	427	395	336	462	474	402	397
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rho	0.362	0.340	0.213	0.490	0.367	0.351	0.301	0.363

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

All models are estimated with random-effect Tobit estimation technique

Table 5. 8 Women's empowerment and English language test scores by age group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	9-11 years	12-14 years	15-17 years	18+	9-11 years	12-14 years	15-17 years	18+
Economic empowerment	7.062	0.563	15.219	2.133				
	(6.762)	(5.603)	(14.463)	(2.855)				
Social empowerment					6.999	4.833	0.364	3.079
					(6.071)	(4.144)	(7.407)	(3.094)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	526	427	337	405	526	427	337	405
Likelihood-ratio (LR) test	143	202	168	137	139	199	128	144
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wald (χ 2)	2012	2224	919	2348	1707	1422	1266	2734
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rho	0.316	0.390	0.335	0.297	0.316	0.361	0.343	0.311

Note: Bootstrap standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

All models are estimated with random-effect Tobit estimation technique

5.4 Summary of main findings

This chapter presented and discussed the effect of women's empowerment on the quality of learning of their wards. Three tests, namely the digit-span cognitive test, the mathematics test, and the English Language test, are used to measure wards' quality of learning. With the scores from these tests as the dependent variables, the study is divided into three samples: the digit-span sample, the mathematics test sample, and the English language test sample. The descriptive results show that the average ward in the digit-span test sample scored 28.5 percent. In comparison, the average scores on the mathematics and English language tests are 64.1 percent and 49.6 percent, respectively. In all three samples, the mean social empowerment index was 0.68, while the mean economic empowerment index score was 0.67 (ranging from 0 to 1).

The results from the panel Tobit framework show a positive relationship between the economic empowerment of women and the cognitive performance of wards. The magnitude of the effect is more substantial for younger wards (age categories). Similarly, the social empowerment of women is significantly (positively) associated with cognitive performance, particularly for wards aged 9-11 and 12-15 years. The results also show that women's economic empowerment is positively associated with mathematics and English language test scores. In contrast, social empowerment is significantly related to mathematics test scores, but not English language test scores.

When the women's economic empowerment measure is decomposed into the sub-components, it is observed that maternal employment status and savings are all associated with improved cognitive performance. Similarly, results from the decomposition into the sub-components of the social empowerment measure indicated that the cognitive development of wards are enhanced when a mother or wife participates in important decisions and is not restricted from making contact with her family.

CHAPTER SIX

EMPIRICAL RESULTS: WOMEN'S ECONOMIC AND SOCIAL EMPOWERMENT AND THE NUTRITIONAL STATUSES OF CHILDREN UNDER FIVE IN GHANA.

6.1 Introduction

This chapter presents the empirical results on the relationship between women's economic empowerment and the nutritional statuses of children under five. The first part of the chapter presents the descriptive statistics of the variables used in the estimations. This is followed by a presentation of the findings from OLS and quantile regression.

6.2 Descriptive and summary statistics

Table 6.1 and Table 6.2 describe how the empowerment indicators are distributed over the two measures of child health, i.e., the long-term child health status (height for age Z-scores) and the short-term child health status (weight-for-height Z-scores), respectively. The three Z-score categories used are the undernourished category (height-for-age Z-scores are less than or equal to -2), the normal category (height-for-age Z-scores are between -2 and 2) and the over nourished category (height-for-age Z-scores are greater than or equal to 2). From a sample of 1522 children, Table 6.1 shows that 642 (763) children are undernourished (normal) while 117 are over nourished when the long-term health status of children is considered.

The economic empowerment measures considered are same as those considered in the previous chapter. Children in the normal category have the highest proportion of employed mothers (66.1%), ability to access credit (10.04) and savings (28.5%). Undernourished children have the highest proportion of mothers who own land (3.81) and the least proportion of employed mothers

(56.8%). Over nourished children have the least proportion of mothers who own land (2.03%) and mothers who can access credit (2.15%).

Table 6. 1 Women's empowerment and long-term health status of under-five children

	Undernourished HAZ<=-2 n=642	Normal =-2<HAZ<2 n=763	Over nourished HAZ>=2 n=117
Economic empowerment			
Mother is employed	56.80%	66.10%	56.99%
Mother owns land	3.81%	3.58%	2.03%
Mother can borrow	5.68%	10.04%	2.15%
Mother has savings	15.09%	28.52%	20.86%
Social empowerment			
Not acceptable to tolerate beating	63.71%	69.49%	71.95%
Family contact not limited by partner	92.63%	96.81%	96.59%
Partner not always demanding wife's location	49.02%	57.50%	70.69%
Not better to educate a son than a daughter	79.54%	88.79%	81.30%
Important decisions not made by only men	56.04%	58.01%	51.26%

Author's computation

The social empowerment indicators used are whether or not a mother disagreed to the following statements: 1. A wife should tolerate being beaten to keep her family together; 2. Husband tried to restrict wife from contacting her family; 3. It is better to educate a son than a daughter; 4. Important family decisions should be made by only the man or husband; 5. Partner wanted to know wife's location at all times. From Table 6.1, while 64% of undernourished children have mothers who do not believe that beating must be tolerated to keep the family together, about 69.5% (72%) of normal (over nourished) children have mothers with the same belief. Respectively, 92.6%, 96.8% and 96.6% of undernourished, normal and over nourished children have mothers who reported that their partners did not limit their contact with their family. While 70.7% of over nourished mothers indicate that their partners do not demand to know their location at all times, 49% and 57.5% of undernourished and normal children share the

experience. Normal children have the highest proportion of mothers who disagree that important decisions ought to be taken by the man (58%), while the least proportion is recorded amongst over nourished children. Normal children have the highest proportion of children whose mothers do not agree that educating a son is better than educating a daughter (88.8%).

Table 6.2 presents the distribution of empowerment indicators over three categories of short-term child health. The three Z-score categories used are the undernourished category (weight-for-height Z-scores are less than or equal to -2), the normal category (weight-for-height Z-scores are between -2 and 2) and the over nourished category (weight-for-height Z-scores are greater than or equal to 2). From Table 6.2, 68.2%, 66.2% and 59.7% of normal, undernourished and over nourished children have employed mothers. Respectively, 2.8%, 4.2% and 3.1% of undernourished, normal and over nourished children have mothers who own land.

Table 6. 2 Women's empowerment and short-term health status of under-five children

	Undernourished WHZ<=-2 n=307	Normal =-2<WHZ<2 n=744	Over nourished WHZ>=2 n=471
Economic empowerment			
Mother is employed	66.20%	68.16%	59.68%
Mother owns land	2.81%	4.17%	3.13%
Mother can borrow	8.12%	9.40%	5.17%
Mother has savings	23.51%	25.90%	19.62%
Social empowerment			
Not acceptable to tolerate beating	72.03%	62.61%	71.33%
Family contact not limited by partner	97.33%	95.25%	93.78%
Partner not always demanding wife's location	57.08%	54.54%	55.02%
Not better to educate a son than a daughter	84.34%	83.32%	86.36%
Important decisions not made by only men	60.01%	52.34%	60.76%

Author's computation

Children in the over nourished category have the least proportion of mothers with access to credit (5.2%) and savings (19.6%), while children in the normal category have the highest proportion of mothers with access to credit (9.4%) and savings (25.9%).

Table 6.3 shows the descriptive statistics of the variables used in this study. Among the sampled children (under five years of age) employed for the study, the average height-for-age Z-score is -0.21, while the average weight-for-height Z-score is 0.98. This means that, on average, the sampled children have better short-term health. The sample consists of 53% males and 47% females. Children from 48 to 59 months old form 25% of the sample, while the age group of children from 0 to 11 months old are least represented with 15%. The children aged 12 to 23 months, 24 to 35 months, and 36 to 47 months make up 20%, 19% and 22% of the sample, respectively. About 63% of the sampled children were registered under a health insurance policy. Regarding religious affiliation, a majority of the sampled children are Christians (59%), while Muslims account for 27%. Akan children make up 46% of the sample, while the children from the ethnic groups in Northern Ghana, Ewes, Ga-Dangbe and Guans accounted for 36%, 12%, 5% and 3%, respectively.

Maternal characteristics used in the study include the mother's age, mother's height, mother's education and the frequency of physical violence on the mother. Mothers of the sampled children have average age and height of 37 years and 156 centimetres respectively. Children of mothers with JSS/Middle school attainment account for 54% of the sampled children. However, only 2% of children have mothers with higher educational attainment. About 7% of mothers in the sample have no education, while 25% (12%) have primary (secondary) education.

Paternal characteristics used in the study include the age of the father, father's height, father's hours of work per week and father's education. Fathers of the sampled children have average

age, height and hours of work of 41 years, 166 centimetres and 8 hours, respectively. Children of fathers with JSS/Middle school attainment account for 54% of the sampled children. Besides, while 8% of children have fathers with higher educational attainment, 3% have no education. About 19% of fathers in the sample have primary education while 16% have up to secondary education.

The study controlled for household and community characteristics to isolate the effect of the empowerment measures. This is because households are embedded in communities, and these communities are likely to influence power relations and affect children's health and nutrition. Households in the sample have an average of about 7 people. About 63% of children in the sample live in rural areas. Also, about 72% of the sampled children live in households with access to a radio set. About 18% of the sampled children drink from surface water sources. Users of other sources classified as unimproved sources (such as unprotected well) and improved non-piped sources (protected well, borehole, sachet water, water truck or tanker service) account for 3% and 49% of the sampled children, respectively. Also, piped outdoor and piped indoor sources of drinking water account for 21% and 10%, respectively.

Furthermore, about 56% of the sampled children live in households with access to improved toilet facilities. Regarding the real household expenditure quintile, 12% (21%) of the sampled children are in the lowest (highest) quintile. The second, third and fourth quintiles make up 20%, 23% and 24% of the sample, respectively. The Ashanti region has the highest representation (17%) while the Upper East Region and Upper West are least represented with 5% each.

Table 6. 3 Summary Statistics

Variable	(N=1,552) Mean	S. D.
Z-Scores		
Height for age	-0.21	0.54
Weight for height	0.98	2.87
Characteristics of children		
Gender of child		
Male	0.53	0.50
Female	0.47	0.50
Age category of child		
0-11 months	0.15	0.35
12-23 months	0.20	0.40
24-35 months	0.19	0.39
36-47 months	0.22	0.41
48-59 months	0.25	0.43
Health Insurance		
Not insured	0.37	0.50
Insured	0.63	0.50
Religion		
Christian	0.59	0.49
Muslim	0.27	0.44
Others	0.14	0.34
Ethnicity		
Akan	0.46	0.48
Ga-Dangbe	0.05	0.22
Ewe	0.12	0.33
Guan	0.03	0.16
Northern ethnic groups	0.36	0.44
Others	0.08	0.28
Characteristics of mothers		
Age of mother	37	12
Mother's education		
None	0.07	0.26
Primary	0.25	0.43
JSS/Middle	0.54	0.50
Secondary	0.12	0.33
Higher	0.02	0.16
Mother's height	156	19
Characteristics of fathers		
Age of father	41	10

Table 6. 3 Summary Statistics (continued)

Variable	(N=1,552) Mean	S. D.
Father's education		
None	0.03	0.16
Primary	0.19	0.39
JSS/Middle	0.54	0.50
Secondary	0.16	0.37
Higher	0.08	0.28
Father's working hours /week	8	19
Father's height	165.67	20.57
Household characteristics		
Real Household Expenditure Quintile		
Lowest	0.12	0.33
Lower	0.20	0.40
Middle	0.23	0.42
Higher	0.24	0.42
Highest	0.21	0.41
Household size	7	3
Drinking water		
Surface water	0.18	0.39
Unimproved water	0.03	0.16
Non-piped improved	0.49	0.50
Piped outdoors	0.21	0.41
Piped indoors	0.10	0.29
Toilet facility		
Unimproved	0.44	0.50
Improved	0.56	0.50
Radio		
Yes	0.72	0.45
No	0.28	0.45
Locality		
Urban	0.37	0.48
Rural	0.63	0.48
Region		
Western	0.10	0.30
Central	0.09	0.28
Gt Accra	0.15	0.28
Volta	0.10	0.30
Eastern	0.07	0.25
Ashanti	0.17	0.37
Brong Ahafo	0.06	0.23
Northern	0.14	0.43
Upper East	0.05	0.22
Upper West	0.05	0.27

Source: Author's computation

6.3 Regression results and discussion

This sub-section presents both OLS regression and quantile regression estimates to examine the association between women's empowerment and child nutrition. First, the effect of women's empowerment (measured by the social empowerment index and the economic empowerment index) on children's long-term and short-term health is discussed in Tables 6.4 - 6.7. Then, the indices are decomposed into the various subcomponents, and their effect on child health is examined. This is followed by a discussion of the other covariates used in the estimations.

6.3.1 Women's empowerment and height-for-age Z-scores

Table 6.4 and Table 6.5 present the OLS and quantile regression estimates when the long-term nutrition of the health of children under age five (height-for-age Z-score) is regressed on women's economic empowerment and women's social empowerment measures and other explanatory variables. In both tables, columns 2 and 3 present the estimates for children in the undernourished category. Columns 4, 5, 6 and 7 show the results for children with normal nutritional status, while columns 8 and 9 present the estimates for over-nourished children below five. Chi-square tests are done to check if the estimates differ for the different quantiles by comparing other quantiles to quantile 4 (**-1<Z<=0**). Although the estimates for other quantiles in the normal range are not different from quantile 4, those of the undernourished quantiles and the over-nourished quantiles are predominantly different from the reference quantile.

From Table 6.4, a unit increase in women's economic empowerment is associated with a 0.18-unit increase in the height-for-age Z-scores at the 5 percent significance level. The quantile regression estimates further show that the economic empowerment of mothers is significantly associated with an increase in her child's height-for-age Z-scores (long-term child health) among the undernourished children and children with Z-scores between -1 and -2.

Table 6. 4 Regression estimates of the relationship between women's economic empowerment and height-for-age Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Economic empowerment	0.179**	0.222***	0.201***	0.160***	0.131	0.113	0.114	0.051	-0.016
	(0.079)	(0.021)	(0.029)	(0.037)	(0.103)	(0.138)	(0.199)	(0.229)	(0.261)
Child age (Ref: 0-11 months)									
12-23 months	-0.049	-0.077***	-0.047***	-0.047	-0.132	-0.132	-0.146	-0.125	-0.087
	(0.063)	(0.009)	(0.011)	(0.042)	(0.154)	(0.081)	(0.096)	(0.118)	(0.142)
24-35 months	-0.041	-0.235***	-0.223***	-0.205***	-0.249***	-0.119	-0.078	-0.037	-0.008
	(0.067)	(0.024)	(0.031)	(0.043)	(0.056)	(0.083)	(0.098)	(0.121)	(0.145)
36-47 months	-0.049	-0.114***	-0.104***	-0.101***	-0.158***	-0.064	-0.072	-0.067	-0.046
	(0.056)	(0.022)	(0.011)	(0.023)	(0.056)	(0.084)	(0.099)	(0.122)	(0.146)
46-59 months	-0.026	-0.072***	-0.064***	-0.080*	-0.049	0.027	-0.032	-0.007	0.016
	(0.058)	(0.011)	(0.019)	(0.043)	(0.056)	(0.084)	(0.099)	(0.122)	(0.147)
Female	0.037	-0.051***	-0.046***	-0.031	0.026	0.056	0.063	0.056	0.042
	(0.028)	(0.001)	(0.007)	(0.019)	(0.032)	(0.067)	(0.081)	(0.086)	(0.091)
Religion (Ref: Christian)									
Muslim	-0.164**	-0.134	-0.148	-0.241	-0.286	-0.213	-0.221	-0.207	-0.211
	(0.069)	(0.104)	(0.123)	(0.163)	(0.204)	(0.219)	(0.266)	(0.281)	(0.298)
Others	-0.024	-0.288	-0.288	-0.261	-0.275	-0.305	-0.286	-0.271	-0.135
	(0.041)	(0.303)	(0.315)	(0.343)	(0.270)	(0.248)	(0.180)	(0.190)	(0.202)
Ethnicity (Ref: Akan)									
Ga-Dangbe	0.110	-0.015***	-0.015	-0.019	0.011	-0.040	-0.051	-0.027	-0.034
	(0.123)	(0.003)	(0.018)	(0.050)	(0.082)	(0.172)	(0.210)	(0.221)	(0.235)
Ewe	0.025	0.077***	0.079***	0.113***	0.149**	0.129	0.090	0.095	0.105
	(0.063)	(0.013)	(0.014)	(0.040)	(0.066)	(0.140)	(0.170)	(0.179)	(0.191)
Guan	0.221**	-0.157***	-0.148***	-0.151**	-0.082	-0.196	-0.157	-0.123	0.144
	(0.091)	(0.014)	(0.022)	(0.061)	(0.101)	(0.212)	(0.258)	(0.272)	(0.289)
Northern tribes	0.043	-0.263***	-0.247***	-0.173**	-0.116	-0.074	-0.099	-0.102	-0.166
	(0.062)	(0.015)	(0.028)	(0.078)	(0.129)	(0.271)	(0.330)	(0.348)	(0.370)

Table 6.4 Regression estimates of the relationship between women's economic empowerment and height-for-age Z-scores among children under five (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Others	0.136	-0.266	-0.251	-0.303	-0.390	-0.332	-0.343	0.155	0.205
	(0.096)	(0.214)	(0.224)	(0.267)	(0.310)	(0.231)	(0.282)	(0.297)	(0.316)
Child has Health insurance	-0.040	0.127***	0.114***	0.109***	0.109***	0.071	0.066	0.073	0.061
	(0.030)	(0.001)	(0.008)	(0.022)	(0.036)	(0.075)	(0.092)	(0.097)	(0.103)
Mother's age	0.005	0.008***	0.013***	0.010***	0.010**	0.010	0.007	0.005	-0.000
	(0.004)	(0.000)	(0.001)	(0.003)	(0.004)	(0.009)	(0.011)	(0.012)	(0.013)
Mother's education (Ref: None)									
Primary	0.042	0.199***	0.229***	0.253***	0.396**	0.435	0.439	0.431	0.473
	(0.064)	(0.016)	(0.035)	(0.096)	(0.159)	(0.334)	(0.407)	(0.429)	(0.456)
JSS/Middle School	0.016	0.569***	0.599***	0.637***	0.694***	0.410**	0.180	-0.645***	-0.767***
	(0.047)	(0.013)	(0.017)	(0.047)	(0.077)	(0.193)	(0.198)	(0.222)	(0.209)
Secondary	0.163	0.680***	0.678***	0.726***	0.789***	0.327**	0.180	-0.711***	-0.856***
	(0.104)	(0.013)	(0.016)	(0.045)	(0.074)	(0.156)	(0.190)	(0.213)	(0.200)
Higher	0.006	0.726***	0.709***	0.752***	0.833***	0.405**	0.254	-0.657**	-0.822***
	(0.164)	(0.013)	(0.020)	(0.055)	(0.090)	(0.190)	(0.231)	(0.259)	(0.244)
Mother's height	0.040***	0.041***	0.038***	0.038***	0.036***	0.032***	0.031***	0.032***	0.033***
	(0.009)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.005)
Father's age	-0.001	-0.005	-0.005	-0.004	-0.004	-0.005	-0.004	-0.003	-0.001
	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.007)	(0.009)	(0.009)	(0.010)
Father's education (Ref: None)									
Primary	0.038	0.373	0.393	0.374	0.403	0.480	0.513	0.524	0.435
	(0.081)	(0.316)	(0.427)	(0.475)	(0.424)	(0.461)	(0.317)	(0.335)	(0.356)
JSS/Middle School	0.045	0.663	0.688	0.659	0.635	0.759	0.738	0.717	0.582
	(0.051)	(0.514)	(0.522)	(0.562)	(0.502)	(0.514)	(0.560)	(0.674)	(0.692)
Secondary	0.107**	0.681***	0.678***	0.668***	0.649***	0.703***	0.684***	0.669**	0.546**
	(0.050)	(0.014)	(0.021)	(0.059)	(0.098)	(0.206)	(0.251)	(0.265)	(0.261)
Higher	0.068	0.832***	0.844***	0.870***	0.829***	0.904***	0.910***	0.887***	0.684**
	(0.081)	(0.014)	(0.023)	(0.065)	(0.108)	(0.226)	(0.275)	(0.291)	(0.309)

Table 6.4 Regression estimates of the relationship between women's economic empowerment and height-for-age Z-scores among children under five (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Father's hours of work	0.000	0.002**	0.002***	0.003***	0.002**	0.002**	0.002*	0.002	0.002
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Father's height	0.008***	0.015***	0.013***	0.014***	0.014***	0.016***	0.014***	0.013**	0.012**
	(0.002)	(0.001)	(0.000)	(0.001)	(0.002)	(0.004)	(0.005)	(0.005)	(0.006)
Expenditure Quintile (Ref: Lowest)									
Lower	-0.055	0.009***	0.019	0.032	0.068	0.082	0.110	0.113	0.114
	(0.046)	(0.012)	(0.013)	(0.035)	(0.058)	(0.121)	(0.148)	(0.156)	(0.166)
Middle	-0.074	0.012***	0.007	0.031	0.099	0.095	0.132	0.146	0.149
	(0.054)	(0.004)	(0.013)	(0.037)	(0.061)	(0.128)	(0.156)	(0.164)	(0.174)
Higher	0.018	0.022***	0.035**	0.033	0.081	0.063	0.101	0.126	0.248
	(0.047)	(0.014)	(0.017)	(0.040)	(0.066)	(0.139)	(0.170)	(0.179)	(0.190)
Highest	-0.061	0.124***	0.124***	0.136***	0.145**	0.153	0.158	0.168	0.178
	(0.059)	(0.002)	(0.013)	(0.037)	(0.061)	(0.128)	(0.156)	(0.165)	(0.175)
Household size	0.000	-0.014***	-0.014***	-0.010	-0.008	0.013	0.016	0.015	0.024
	(0.007)	(0.001)	(0.004)	(0.012)	(0.020)	(0.042)	(0.051)	(0.054)	(0.057)
Drinking water (Ref: Surface water)									
Unimproved water	0.108	-0.235	-0.209	-0.191	-0.240	-0.209	-0.202	-0.168	0.009
	(0.092)	(0.305)	(0.327)	(0.375)	(0.224)	(0.261)	(0.317)	(0.335)	(0.356)
Non-piped improved	0.015	0.029	0.021	0.027	0.008	0.001	-0.019	-0.015	-0.030
	(0.029)	(0.042)	(0.032)	(0.033)	(0.055)	(0.116)	(0.141)	(0.149)	(0.158)
Piped outdoors	0.026	0.145***	0.081***	0.140***	0.107*	0.081	0.051	0.051	0.075
	(0.051)	(0.032)	(0.024)	(0.038)	(0.063)	(0.132)	(0.161)	(0.170)	(0.180)
Piped indoors	0.018	0.125***	0.105***	0.069	0.111	0.099	0.114	0.116	0.214
	(0.076)	(0.023)	(0.027)	(0.047)	(0.078)	(0.164)	(0.200)	(0.211)	(0.225)
Improved toilet facility	0.042	0.227***	0.207***	0.189***	0.174***	0.116	0.098	0.096	0.104
	(0.037)	(0.011)	(0.008)	(0.022)	(0.036)	(0.077)	(0.093)	(0.099)	(0.105)
Radio	0.174	0.084	0.084***	0.073	0.104	0.071	0.062	0.059	0.080
	(0.065)	(0.203)	(0.117)	(0.147)	(0.177)	(0.162)	(0.197)	(0.208)	(0.221)

Table 6.4 Regression estimates of the relationship between women's economic empowerment and height-for-age Z-scores among children under five (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Urban	0.098**	0.051***	0.036***	0.081***	0.128***	0.165***	0.255***	0.157	0.153
	(0.041)	(0.017)	(0.010)	(0.029)	(0.048)	(0.050)	(0.082)	(0.128)	(0.131)
Region (Ref: Greater Accra Region)									
Western Region	0.053	-0.004	-0.004	0.021	-0.028	-0.073	-0.122	-0.111	-0.051
	(0.100)	(0.003)	(0.017)	(0.048)	(0.078)	(0.165)	(0.201)	(0.212)	(0.225)
Central Region	0.036	-0.083***	-0.083***	-0.075	-0.118	-0.155	-0.185	-0.144	-0.102
	(0.104)	(0.003)	(0.019)	(0.054)	(0.089)	(0.188)	(0.228)	(0.241)	(0.256)
Volta Region	-0.056	0.008**	0.008	-0.037	-0.064	-0.105	-0.083	-0.062	-0.029
	(0.086)	(0.003)	(0.018)	(0.051)	(0.085)	(0.178)	(0.217)	(0.229)	(0.243)
Eastern Region	0.050	0.264***	0.264***	0.297***	0.231***	0.129	0.092	0.080	0.027
	(0.134)	(0.003)	(0.018)	(0.051)	(0.084)	(0.176)	(0.214)	(0.225)	(0.240)
Ashanti Region	0.173	-0.091***	-0.091***	-0.037	-0.055	-0.172	-0.227	-0.199	-0.111
	(0.113)	(0.003)	(0.017)	(0.047)	(0.077)	(0.162)	(0.197)	(0.208)	(0.221)
Brong Ahafo Region	0.008	-0.211***	-0.211***	-0.119*	-0.125	-0.193	-0.234	-0.228	-0.216
	(0.133)	(0.004)	(0.024)	(0.068)	(0.112)	(0.235)	(0.286)	(0.302)	(0.321)
Northern Region	0.110	0.359***	0.359***	0.347***	0.342***	0.216	0.165	0.148	0.042
	(0.111)	(0.004)	(0.025)	(0.069)	(0.115)	(0.241)	(0.293)	(0.309)	(0.329)
Upper East Region	0.148	0.295***	0.295***	0.316***	0.340**	0.213	0.155	0.198	0.172
	(0.116)	(0.005)	(0.031)	(0.088)	(0.144)	(0.303)	(0.369)	(0.390)	(0.414)
Upper West Region	0.159	0.107***	0.305***	0.181*	0.183	0.048	-0.010	0.001	0.019
	(0.121)	(0.006)	(0.033)	(0.093)	(0.153)	(0.321)	(0.391)	(0.412)	(0.438)
Constant	-2.685	-3.039***	-3.039***	-3.125***	-3.340***	-3.469***	-3.395***	-3.393***	-3.309***
	(0.000)	(0.008)	(0.047)	(0.131)	(0.216)	(0.454)	(0.552)	(0.583)	(0.619)
Observations	1,552	1,552	1,552	1,552	1,552	1,552	1,552	1,552	1,552
Chi-squared		9.023	16.520	17.770		48.645	21.456	12.654	11.957
Prob		[0.650]	[0.091]	[0.079]		[0.000]	[0.001]	[0.386]	[0.328]

Robust standard errors in parentheses. P-values in []. *** p<0.01, ** p<0.05, * p<0.1.

A unit increase in the measure of women's economic empowerment is associated with approximately 0.2 units higher Z-scores. This shows that women's economic empowerment plays a significant role in improving children's long-term health, especially for the undernourished. This finding echoes the works of Essilfie *et al*. (2020), Hoddinott & Haddad (1995) and Quisumbing & Maluccio (2003). They noted that when women have access to resources, they can make ample investment to improve children's health.

Table 6.5 presents both OLS and quantile regression estimates. Although the OLS coefficient for social empowerment of women is bis positive, it is not significant. However, the quantile regression shows that the measure of social empowerment of women is significantly associated with the long-term nutritional status of undernourished children and children with Z-scores between 0 and -2. A unit increase in the measure of social empowerment of women is associated with between 0.14-units and 0.16-units higher Z-scores. This shows that social norms that promote the agency of mothers have a positive reflection on the health of their children. This finding supports earlier works done by Abekah-Nkrumah & Lawson (2020), Mabsout & van Staveren (2010) and SOFA Team & Doss (2011). They noted that essential gains in child health might be realised by altering broader social institutions to enhance women's agency.

Table 6. 5 Regression estimates of the relationship between women's social empowerment and height-for-age Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	**OLS**	**Z<=-3**	**-3<Z<=-2**	**-2<Z<=-1**	**-1<Z<=0**	**0<Z<=1**	**1<Z<=2**	**2<Z<=3**	**3<Z**
Social empowerment	0.023	0.161***	0.151***	0.145***	0.137**	0.122	0.112	0.075	0.026
	(0.064)	(0.013)	(0.022)	(0.041)	(0.060)	(0.081)	(0.116)	(0.134)	(0.152)
Child age (Ref: 0-11 months)									
12-23 months	-0.024	-0.125***	-0.105***	-0.101***	-0.073***	-0.001	-0.001	-0.017	-0.015
	(0.068)	(0.023)	(0.024)	(0.024)	(0.033)	(0.042)	(0.073)	(0.100)	(0.118)
24-35 months	-0.004	-0.169***	-0.164***	-0.167***	-0.154***	-0.144***	-0.143*	-0.127	-0.130
	(0.070)	(0.010)	(0.023)	(0.026)	(0.033)	(0.043)	(0.076)	(0.103)	(0.122)
36-47 months	-0.058	-0.089***	-0.072***	-0.109***	-0.104***	-0.073*	-0.074	-0.116	-0.127
	(0.070)	(0.008)	(0.014)	(0.020)	(0.023)	(0.043)	(0.075)	(0.102)	(0.120)
46-59 months	-0.000	-0.046***	-0.046***	-0.096***	-0.044	-0.010	-0.010	-0.006	-0.020
	(0.071)	(0.010)	(0.013)	(0.033)	(0.054)	(0.033)	(0.074)	(0.102)	(0.120)
Female	-0.085**	-0.081***	-0.075***	-0.069*	-0.062	-0.065	-0.059	-0.043	-0.040
	(0.040)	(0.020)	(0.018)	(0.036)	(0.037)	(0.050)	(0.072)	(0.083)	(0.095)
Religion (Ref: Christian)									
Muslim	0.046	-0.005	-0.005	-0.029	-0.057	0.019	0.018	0.021	0.023
	(0.087)	(0.012)	(0.017)	(0.030)	(0.082)	(0.111)	(0.159)	(0.183)	(0.209)
Others	0.288	0.034	0.074	0.073	0.068	0.045	0.046	0.001	0.031
	(0.204)	(0.065)	(0.081)	(0.070)	(0.192)	(0.259)	(0.373)	(0.428)	(0.488)
Ethnicity (Ref: Akan)									
Ga-Dangbe	0.004	-0.047***	-0.019***	-0.024	-0.029	-0.041	-0.041	-0.058	-0.075
	(0.101)	(0.000)	(0.000)	(0.035)	(0.097)	(0.131)	(0.188)	(0.216)	(0.246)
Ewe	0.017	0.123***	0.201***	0.147*	0.057	0.083	0.054	0.010	0.042
	(0.081)	(0.000)	(0.000)	(0.078)	(0.077)	(0.103)	(0.148)	(0.170)	(0.194)
Guan	0.041	0.035***	0.019***	0.025	-0.041	0.006	-0.015	0.025	0.046
	(0.124)	(0.000)	(0.002)	(0.042)	(0.117)	(0.157)	(0.226)	(0.260)	(0.296)
Northern tribes	-0.234	-0.318***	-0.347***	-0.357***	-0.271*	-0.147	-0.149	-0.206	-0.225
	(0.165)	(0.000)	(0.041)	(0.055)	(0.151)	(0.203)	(0.292)	(0.335)	(0.382)

Table 6.5 Regression estimates of the relationship between women's social empowerment and height-for-age Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	**OLS**	**Z<=-3**	**-3<Z<=-2**	**-2<Z<=-1**	**-1<Z<=0**	**0<Z<=1**	**1<Z<=2**	**2<Z<=3**	**3<Z**
Others	0.219	-0.090***	-0.051***	-0.054	-0.183	-0.394**	-0.365	-0.022	0.176
	(0.147)	(0.004)	(0.010)	(0.050)	(0.138)	(0.186)	(0.268)	(0.308)	(0.351)
Child has health insurance	0.087*	0.145***	0.131***	0.124***	0.108**	0.101*	0.094	0.071	0.046
	(0.045)	(0.007)	(0.009)	(0.015)	(0.042)	(0.057)	(0.082)	(0.094)	(0.107)
Mother's age	0.008	0.005***	0.007***	0.011***	0.010**	0.010	0.010	-0.007	-0.004
	(0.006)	(0.001)	(0.001)	(0.002)	(0.005)	(0.007)	(0.010)	(0.012)	(0.013)
Mother's education (Ref: None)									
Primary	0.056	1.249***	1.139***	1.179***	1.135***	1.044***	1.054	-0.580**	-0.743***
	(0.097)	(0.000)	(0.019)	(0.033)	(0.092)	(0.124)	(1.178)	(0.233)	(0.205)
JSS/Middle School	0.086	1.216***	1.186***	1.224***	1.201***	1.148***	1.153	-0.641***	-0.843***
	(0.092)	(0.016)	(0.018)	(0.032)	(0.087)	(0.117)	(1.169)	(0.221)	(0.194)
Secondary	0.212*	1.201***	1.085***	1.134***	1.086***	1.013***	1.029	-0.507**	-0.690***
	(0.111)	(0.000)	(0.022)	(0.038)	(0.105)	(0.141)	(1.204)	(0.246)	(0.234)
Higher	0.279	0.951***	0.961***	0.943***	0.877***	0.912***	0.887	0.518	0.657
	(0.196)	(0.029)	(0.038)	(0.067)	(0.184)	(0.247)	(1.356)	(0.466)	(0.409)
Mother's height	0.007**	0.008***	0.008***	0.008***	0.005**	0.007**	0.006	0.005	0.004
	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.005)	(0.005)	(0.006)
Father's age	-0.003	0.001	0.001	0.002	0.002	0.003	0.001	0.002	0.003
	(0.004)	(0.002)	(0.001)	(0.001)	(0.004)	(0.005)	(0.008)	(0.009)	(0.010)
Father's education (Ref: None)									
Primary	0.146	0.912	0.912	0.934	0.857	0.749	0.745	0.531	0.514
	(0.125)	(0.720)	(0.725)	(0.743)	(0.818)	(0.859)	(0.729)	(0.664)	(0.800)
JSS/Middle School	0.108	0.899	0.854	0.883	0.825	0.720	0.729	0.518	0.474
	(0.121)	(0.737)	(0.724)	(0.741)	(0.814)	(0.854)	(0.721)	(0.654)	(0.590)
Secondary	0.216	1.241	1.215	1.263	1.143	1.039	1.070	0.823	0.714
	(0.134)	(1.017)	(1.026)	(1.046)	(1.127)	(1.171)	(1.245)	(1.282)	(1.321)
Higher	0.073	0.725	0.664	0.709	0.633	0.577	0.603	0.425	0.354
	(0.654)	(0.728)	(0.630)	(0.652)	(0.643)	(0.593)	(0.578)	(0.419)	(0.364)

Table 6.5 Regression estimates of the relationship between women's social empowerment and height-for-age Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over-nourished	
VARIABLES	**OLS**	**Z<=-3**	**-3<Z<=-2**	**-2<Z<=-1**	**-1<Z<=0**	**0<Z<=1**	**1<Z<=2**	**2<Z<=3**	**3<Z**
Father's hours of work	0.003	0.002***	0.002***	0.003***	0.003***	0.003***	0.003	0.003	0.003
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)	(0.004)	(0.002)
Father's height	0.037***	0.086***	0.059***	0.039***	0.038***	0.036***	0.036***	0.035***	0.034***
	(0.014)	(0.028)	(0.013)	(0.009)	(0.001)	(0.002)	(0.003)	(0.004)	(0.004)
Expenditure Quintile (Ref: Lowest)									
Lower	0.024	0.018	0.019	0.022	0.034	0.089	0.109	0.195	0.175
	(0.084)	(0.017)	(0.029)	(0.056)	(0.079)	(0.107)	(0.154)	(0.177)	(0.201)
Middle	0.017	0.077***	0.061***	0.061**	0.047	0.020	0.028	0.015	0.033
	(0.072)	(0.000)	(0.014)	(0.025)	(0.068)	(0.091)	(0.132)	(0.151)	(0.172)
Higher	0.021	0.107***	0.077***	0.062**	0.039	0.040	0.043	0.027	0.006
	(0.077)	(0.000)	(0.015)	(0.026)	(0.072)	(0.097)	(0.140)	(0.161)	(0.183)
Highest	0.047	0.143***	0.143***	0.152***	0.142*	0.145	0.159	0.147	0.119
	(0.077)	(0.000)	(0.015)	(0.026)	(0.073)	(0.098)	(0.141)	(0.162)	(0.185)
Household size	-0.046*	-0.022***	-0.019***	-0.040***	-0.042*	-0.043	-0.047	-0.048	-0.043
	(0.024)	(0.005)	(0.007)	(0.008)	(0.023)	(0.031)	(0.044)	(0.051)	(0.058)
Drinking water (Ref: Surface water)									
Unimproved water	0.073	-0.016	-0.079	-0.091	-0.160	-0.102	-0.082	-0.004	-0.041
	(0.154)	(0.022)	(0.069)	(0.153)	(0.145)	(0.196)	(0.282)	(0.324)	(0.369)
Non-piped improved	0.069	0.161***	0.161***	0.154***	0.156**	0.129	0.109	0.066	0.061
	(0.068)	(0.000)	(0.014)	(0.024)	(0.065)	(0.087)	(0.126)	(0.144)	(0.165)
Piped outdoors	0.112	0.073***	0.068***	0.053**	0.081	0.078	0.067	0.022	0.037
	(0.074)	(0.015)	(0.013)	(0.027)	(0.073)	(0.099)	(0.142)	(0.163)	(0.186)
Piped indoors	0.147	0.248***	0.267***	0.319***	0.289***	0.313**	0.295	0.299	0.276
	(0.096)	(0.013)	(0.019)	(0.034)	(0.093)	(0.125)	(0.180)	(0.207)	(0.236)
Improved toilet facility	0.096**	0.282***	0.276***	0.272***	0.256***	0.260	0.258	0.197	0.208
	(0.045)	(0.022)	(0.019)	(0.025)	(0.043)	(0.177)	(0.282)	(0.195)	(0.188)
Radio	0.056	0.725	0.525	0.546	0.339	0.272	0.177	0.254	0.221
	(0.434)	(0.598)	(0.586)	(0.449)	(0.491)	(0.554)	(0.797)	(0.916)	(1.043)

Table 6.5 Regression estimates of the relationship between women's social empowerment and height-for-age Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	**OLS**	**Z<=-3**	**-3<Z<=-2**	**-2<Z<=-1**	**-1<Z<=0**	**0<Z<=1**	**1<Z<=2**	**2<Z<=3**	**3<Z**
Urban	0.062	0.044***	0.036***	0.074***	0.161***	0.307***	0.320***	0.108	0.071
	(0.065)	(0.000)	(0.012)	(0.021)	(0.057)	(0.077)	(0.110)	(0.127)	(0.144)
Region (Ref: Greater Accra Region)									
Western Region	0.043	-0.015***	-0.015	-0.056*	-0.048	-0.062	-0.088	-0.109	-0.067
	(0.096)	(0.000)	(0.019)	(0.033)	(0.091)	(0.122)	(0.176)	(0.202)	(0.230)
Central Region	-0.019	-0.077***	-0.127***	-0.145***	-0.125	-0.120	-0.150	-0.136	-0.096
	(0.107)	(0.021)	(0.028)	(0.037)	(0.103)	(0.139)	(0.199)	(0.229)	(0.261)
Volta Region	-0.079	-0.117***	-0.072***	-0.046	-0.009	-0.036	-0.032	-0.031	-0.037
	(0.103)	(0.020)	(0.021)	(0.036)	(0.099)	(0.133)	(0.192)	(0.220)	(0.251)
Eastern Region	0.132	0.202***	0.174***	0.114***	0.095	0.102	0.070	0.059	0.099
	(0.102)	(0.019)	(0.020)	(0.035)	(0.097)	(0.130)	(0.187)	(0.215)	(0.245)
Ashanti Region	0.188*	-0.248***	-0.197***	-0.255***	-0.239***	-0.220*	-0.257	-0.214	-0.174
	(0.096)	(0.015)	(0.018)	(0.032)	(0.088)	(0.119)	(0.171)	(0.197)	(0.224)
Brong Ahafo Region	-0.100	-0.031***	-0.053**	-0.131***	-0.135	-0.104	-0.156	-0.169	-0.140
	(0.136)	(0.005)	(0.027)	(0.046)	(0.128)	(0.172)	(0.248)	(0.285)	(0.325)
Northern Region	0.067	0.191***	0.211***	0.135***	0.137	0.018	-0.027	-0.075	-0.138
	(0.146)	(0.027)	(0.029)	(0.050)	(0.137)	(0.185)	(0.266)	(0.306)	(0.348)
Upper East Region	0.034	0.481**	0.437***	0.473***	0.363**	0.279	0.263	0.195	0.139
	(0.180)	(0.033)	(0.035)	(0.061)	(0.167)	(0.225)	(0.324)	(0.372)	(0.424)
Upper West Region	-0.039	0.169***	0.173***	0.127*	0.068	0.025	-0.038	0.022	-0.011
	(0.190)	(0.036)	(0.038)	(0.065)	(0.180)	(0.243)	(0.349)	(0.401)	(0.457)
Constant	-2.174***	-2.021***	-2.021***	-2.075***	-2.423***	-2.443***	-2.396**	-2.417**	-2.494*
	(0.532)	(0.000)	(0.104)	(0.182)	(0.501)	(0.674)	(0.970)	(1.115)	(1.270)
Observations	1552	1552	1552	1552	1552	1552	1552	1552	1552
Chi-squared		10.001	18.370	20.545		88.74	23.467	11.010	9.455
Prob		[0.290]	[0.067]	[0.041]		[0.000]	[0.001]	[0.288]	[0.402]

Robust standard errors in parentheses. P-values in []. *** p<0.01, ** p<0.05, * p<0.1.

6.3.2 Women's empowerment and weight-for-height Z-scores

Table 6.6 presents the OLS and quantile regression estimates when the short-term health status of children under age five (weight-for-height Z-scores) is regressed on women's economic empowerment and other explanatory variables. Columns 2 and 3 present the estimates for children in the undernourished category. Columns 4, 5, 6 and 7 show the results for children with normal nutritional status, while columns 8 and 9 present the estimates for over-nourished children below five. Again, the differences between the OLS estimates and quantile regression estimates provide support for examining the effect of women's empowerment for different child health quantiles. Chi-square tests are performed to check if the estimates differ for the different quantiles by comparing other quantiles to quantile 4 (**-1<Z<=0**). It is observed that the estimates for other quantiles in the normal range are not significantly different from that of quantile 4. However, those of the undernourished quantiles and the over-nourished quantiles are predominantly different from the reference quantile at the 5 percent level of significance.

From Table 6.6, the coefficient for the measure of women's economic empowerment, although insignificant in the OLS estimation, is significantly associated with the short-term nutritional status of undernourished children at the 1 percent level. A unit increase in the measure of women's economic empowerment is associated with between 0.32-units and 0.34-units increase in the weight-for-height Z-scores among undernourished children. This result shows that although maternal access to resources does not significantly improve the short-term health of all children (see model 1 of Table 6.6), wasted children may experience short-term health gains when their mothers are empowered via increased resource access.

Table 6. 6 Regression estimates of the relationship between women's economic empowerment and weight-for-height Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Economic empowerment	0.188	0.342***	0.317***	0.300*	0.202	0.096	0.012	-0.036	-0.030
	(0.650)	(0.074)	(0.047)	(0.181)	(0.236)	(0.352)	(0.415)	(0.513)	(0.615)
Child age (Ref: 0-11 months)									
12-23 months	0.436	0.084***	0.095***	0.079**	0.088	0.078	0.065	0.071	0.103
	(0.296)	(0.009)	(0.012)	(0.033)	(0.054)	(0.114)	(0.139)	(0.146)	(0.155)
24-35 months	0.252	0.238***	0.226***	0.193***	0.195***	0.163	0.186	0.197	0.228
	(0.296)	(0.021)	(0.012)	(0.034)	(0.056)	(0.117)	(0.142)	(0.150)	(0.160)
36-47 months	0.795***	0.239***	0.234***	0.209***	0.199***	0.169	0.177	0.193	0.207
	(0.263)	(0.002)	(0.012)	(0.034)	(0.056)	(0.118)	(0.143)	(0.151)	(0.161)
46-59 months	0.549*	0.321***	0.301***	0.301***	0.299***	0.204*	0.269*	0.273*	0.278*
	(0.283)	(0.002)	(0.012)	(0.034)	(0.056)	(0.108)	(0.134)	(0.152)	(0.162)
Female	-0.024	-0.082***	-0.071***	-0.062***	-0.048	0.028	0.046	0.043	0.058
	(0.145)	(0.006)	(0.012)	(0.021)	(0.032)	(0.047)	(0.056)	(0.069)	(0.082)
Religion (Ref: Christian)									
Muslim	0.146	0.694	0.663	0.526	0.487	0.444	0.418	0.462	0.463
	(0.222)	(0.515)	(0.551)	(0.559)	(0.576)	(0.514)	(0.435)	(0.366)	(0.399)
Others	0.170	0.175	0.157	0.145	0.099	0.098	0.020	-0.053	0.014
	(0.421)	(0.121)	(0.142)	(0.170)	(0.103)	(0.154)	(0.182)	(0.225)	(0.270)
Ethnicity (Ref: Akan)									
Ga-Dangbe	0.388	0.523***	0.520***	0.524***	0.526***	0.462***	0.428***	0.395**	0.334
	(0.530)	(0.016)	(0.033)	(0.063)	(0.081)	(0.121)	(0.143)	(0.177)	(0.212)
Ewe	0.116	0.221***	0.219***	0.211***	0.306***	0.214**	0.147	0.137	0.087
	(0.305)	(0.013)	(0.043)	(0.051)	(0.066)	(0.099)	(0.116)	(0.144)	(0.172)
Guan	-0.191	-0.411***	-0.404***	-0.372***	0.176*	0.159	-0.006	-0.052	-0.064
	(0.362)	(0.020)	(0.056)	(0.077)	(0.100)	(0.149)	(0.176)	(0.217)	(0.261)
Northern tribes	0.237	-0.197***	-0.157***	-0.139***	-0.116	-0.233*	-0.294*	-0.331*	-0.319
	(0.326)	(0.018)	(0.048)	(0.040)	(0.091)	(0.135)	(0.150)	(0.197)	(0.237)

Table 6.6 Regression estimates of the relationship between women's economic empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Others	0.119	1.406***	1.371***	1.346***	1.324***	0.921***	0.743***	0.752***	0.665**
	(0.405)	(0.053)	(0.074)	(0.087)	(0.114)	(0.169)	(0.200)	(0.247)	(0.296)
Child has health insurance	0.329**	0.208***	0.202***	0.184***	0.170***	0.154***	0.149**	0.186**	0.178**
	(0.152)	(0.021)	(0.027)	(0.028)	(0.036)	(0.054)	(0.063)	(0.078)	(0.084)
Mother's age	0.036**	0.018***	0.016***	0.017***	0.018***	0.009	0.007	0.004	0.008
	(0.017)	(0.002)	(0.002)	(0.003)	(0.004)	(0.007)	(0.008)	(0.010)	(0.011)
Mother's education (Ref: None)									
Primary	0.513*	0.472***	0.432***	0.421***	0.395***	0.323***	0.077	0.170	-0.179
	(0.311)	(0.035)	(0.047)	(0.059)	(0.077)	(0.114)	(0.135)	(0.167)	(0.200)
JSS/Middle School	0.242	0.304***	0.282***	0.264***	0.259***	0.245**	0.135	0.136	0.131
	(0.240)	(0.015)	(0.032)	(0.057)	(0.073)	(0.110)	(0.129)	(0.160)	(0.192)
Secondary	-0.041	0.608***	0.601***	0.599***	0.596***	0.487***	0.340**	0.335*	0.308
	(0.470)	(0.018)	(0.043)	(0.069)	(0.090)	(0.134)	(0.158)	(0.195)	(0.234)
Higher	1.023	0.467***	0.434***	0.417***	0.484***	0.266	0.169	0.196	0.202
	(0.958)	(0.089)	(0.132)	(0.122)	(0.158)	(0.236)	(0.278)	(0.344)	(0.412)
Mother's height	0.005**	-0.002	-0.002	-0.003	-0.002	-0.001	0.003	0.007	0.008
	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.004)	(0.005)	(0.006)	(0.006)
Father's age	0.008	0.017***	0.017***	0.014***	0.020***	0.014***	0.014**	0.012	0.013
	(0.011)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)	(0.007)	(0.009)
Father's education (Ref: None)									
Primary	-0.383	0.621***	0.583***	0.551***	0.415***	0.292*	0.235	0.293	0.263
	(0.235)	(0.020)	(0.056)	(0.078)	(0.101)	(0.150)	(0.177)	(0.219)	(0.263)
JSS/Middle School	0.309	0.478***	0.447***	0.432***	0.381***	0.230	0.181	0.243	0.287
	(0.241)	(0.019)	(0.066)	(0.075)	(0.097)	(0.145)	(0.171)	(0.211)	(0.253)
Secondary	0.403	0.649***	0.692***	0.549***	0.543***	0.421***	0.419**	0.449*	0.428
	(0.374)	(0.021)	(0.049)	(0.082)	(0.107)	(0.159)	(0.188)	(0.232)	(0.279)
Higher	-0.256	0.415***	0.402***	0.323***	0.125	0.086	0.175	0.275	0.254
	(0.382)	(0.025)	(0.053)	(0.095)	(0.123)	(0.183)	(0.217)	(0.268)	(0.321)

Table 6.6 Regression estimates of the relationship between women's economic empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Father's hours of work	-0.006	0.005***	0.004***	0.004***	0.003***	0.004***	0.004***	0.004***	0.004**
	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Father's height	0.042***	0.039***	0.038***	0.041***	0.042***	0.037***	0.038***	0.036***	0.033***
	(0.007)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)
Expenditure Quintile (Ref: Lowest)									
Lower	0.133	0.116***	0.118***	0.126***	0.150***	0.229***	0.265***	0.127	0.062
	(0.216)	(0.012)	(0.036)	(0.044)	(0.058)	(0.086)	(0.102)	(0.126)	(0.151)
Middle	0.422	0.068***	0.068***	0.082	0.091	0.138	0.230**	0.096	0.019
	(0.271)	(0.012)	(0.032)	(0.047)	(0.061)	(0.090)	(0.107)	(0.132)	(0.158)
Higher	0.112	0.150***	0.152***	0.141***	0.210***	0.204**	0.226**	0.132	0.063
	(0.214)	(0.012)	(0.029)	(0.047)	(0.061)	(0.091)	(0.107)	(0.133)	(0.159)
Highest	0.057	0.238***	0.220***	0.286***	0.258***	0.286***	0.384***	0.275*	0.217
	(0.268)	(0.013)	(0.041)	(0.051)	(0.066)	(0.098)	(0.116)	(0.144)	(0.172)
Household size	-0.028	-0.069	-0.077	-0.074	-0.077	-0.071	-0.049	-0.060	-0.067
	(0.032)	(0.050)	(0.054)	(0.055)	(0.62)	(0.069)	(0.035)	(0.043)	(0.051)
Drinking water (Ref: Surface water)									
Unimproved water	0.054	0.098***	0.098***	0.098	0.094	0.083	0.087	0.072	0.057
	(0.266)	(0.025)	(0.032)	(0.095)	(0.123)	(0.183)	(0.217)	(0.267)	(0.321)
Non-piped improved	0.261*	0.041***	0.040***	0.038	0.027	0.016	0.092	0.112	0.081
	(0.140)	(0.008)	(0.012)	(0.042)	(0.055)	(0.082)	(0.097)	(0.120)	(0.144)
Piped outdoors	0.121	0.097***	0.094***	0.091**	0.084	0.069	0.104	0.106	0.072
	(0.263)	(0.012)	(0.032)	(0.048)	(0.062)	(0.093)	(0.110)	(0.136)	(0.163)
Piped indoors	0.192	0.280***	0.280***	0.280***	0.238***	0.203**	0.296**	0.217	0.209
	(0.431)	(0.000)	(0.016)	(0.060)	(0.078)	(0.097)	(0.138)	(0.171)	(0.205)
Improved toilet facility	0.209	0.114***	0.114***	0.114***	0.083**	0.102*	0.074	0.053	0.032
	(0.200)	(0.000)	(0.007)	(0.028)	(0.036)	(0.054)	(0.064)	(0.079)	(0.094)
Radio	0.040	0.091	0.095	0.101	0.113	0.040	0.043	0.047	0.046
	(0.185)	(0.416)	(0.429)	(0.433)	(0.443)	(0.464)	(0.476)	(0.394)	(0.412)

Table 6.6 Regression estimates of the relationship between women's economic empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Urban	0.367*	0.124***	0.104***	0.132***	0.143***	0.147**	0.169**	0.123	0.112
	(0.209)	(0.027)	(0.029)	(0.036)	(0.047)	(0.070)	(0.083)	(0.103)	(0.123)
Region (Ref: Greater Accra Region)									
Western Region	0.347	0.316***	0.301***	0.264***	0.246***	0.354***	0.324**	0.235	0.203
	(0.438)	(0.016)	(0.041)	(0.060)	(0.078)	(0.116)	(0.137)	(0.169)	(0.203)
Central Region	0.124	0.550***	0.543***	0.530***	0.521***	0.443***	0.374**	0.334*	0.322
	(0.453)	(0.018)	(0.047)	(0.068)	(0.089)	(0.132)	(0.156)	(0.193)	(0.231)
Volta Region	-0.504	-0.061***	-0.061***	-0.161**	-0.166**	0.072	0.146	0.279	0.340
	(0.442)	(0.017)	(0.017)	(0.065)	(0.084)	(0.126)	(0.149)	(0.184)	(0.220)
Eastern Region	0.347	0.142***	0.166***	0.182***	0.174**	0.218*	0.280*	0.361**	0.364*
	(0.547)	(0.017)	(0.045)	(0.064)	(0.083)	(0.124)	(0.146)	(0.180)	(0.216)
Ashanti Region	0.477	0.818***	0.745***	0.718***	0.716***	0.713***	0.636***	0.624***	0.591***
	(0.515)	(0.015)	(0.043)	(0.059)	(0.077)	(0.114)	(0.135)	(0.167)	(0.200)
Brong Ahafo Region	0.388	0.751***	0.737***	0.711***	0.682***	0.743***	0.753***	0.654***	0.603**
	(0.564)	(0.022)	(0.058)	(0.086)	(0.111)	(0.166)	(0.196)	(0.242)	(0.290)
Northern Region	-0.266	0.701***	0.687***	0.645***	0.674***	0.703***	0.662***	0.599**	0.547*
	(0.475)	(0.023)	(0.052)	(0.088)	(0.114)	(0.170)	(0.201)	(0.248)	(0.297)
Upper East Region	0.396	0.134***	0.304***	0.432***	0.337**	0.630***	0.822***	0.836***	0.768**
	(0.490)	(0.029)	(0.076)	(0.111)	(0.143)	(0.214)	(0.253)	(0.312)	(0.375)
Upper West Region	-0.183	0.669***	0.674***	0.676***	0.698***	0.728***	0.734***	0.596*	0.566
	(0.537)	(0.030)	(0.086)	(0.117)	(0.151)	(0.226)	(0.267)	(0.330)	(0.396)
Constant	3.194***	1.270***	1.460***	1.970***	2.060***	2.147***	2.152***	1.999***	1.798*
	(1.205)	(0.270)	(0.287)	(0.291)	(0.352)	(0.525)	(0.621)	(0.766)	(0.919)
Observations	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518
Chi-squared		14.421	15.098	21.085		69.034	22.798	10.010	8.399
Prob		[0.095]	[0.089]	[0.007]		[0.000]	[0.001]	[0.295]	[0.468]

Robust standard errors in parentheses. P-values in []. *** p<0.01, ** p<0.05, * p<0.1.

Table 6.7 presents quantile regression estimates with the short-term child health regressed on social empowerment measures and other independent variables. Columns 2 and 3 present the estimates for children in the undernourished category. Columns 4, 5, 6 and 7 show the results for children with normal nutritional status, while columns 8 and 9 present the estimates for over-nourished children below age five. The results show a strong positive relationship between the social empowerment index and the short-term health of children below age five. Specifically, the OLS estimate shows that a unit increase in the social empowerment measure is associated with s 0.57-units improvement in the short-term nutritional status of children below age five.

Also, social empowerment increases the weight-for-height Z-scores in all the quantiles, although it is marginally significant for over nourished children. This study, therefore, corroborates the work done by Abekah-Nkrumah & Lawson (2020), Jütting & Morrisson (2005), Mabsout & van Staveren (2010) and Morrisson & Jutting (2004). They noted that when social norms are more empowering for women, their agency is enhanced, and their children tend to be healthier.

Table 6. 7 Regression estimates of the relationship between women's social empowerment and weight-for-height Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Social empowerment	0.568***	0.491***	0.441***	0.421***	0.412***	0.358***	0.329**	0.315*	0.351*
	(0.160)	(0.073)	(0.076)	(0.060)	(0.078)	(0.117)	(0.138)	(0.171)	(0.205)
Child age (Ref: 0-11 months)									
12-23 months	0.374	0.098***	0.081***	0.089***	0.085	0.119	0.130	0.082	0.016
	(0.378)	(0.000)	(0.013)	(0.023)	(0.064)	(0.087)	(0.125)	(0.143)	(0.163)
24-35 months	0.446	0.200***	0.119***	0.105***	0.139**	0.070	0.051	0.082	0.102
	(0.386)	(0.013)	(0.014)	(0.024)	(0.066)	(0.089)	(0.128)	(0.147)	(0.168)
36-47 months	0.341	0.208***	0.208***	0.208***	0.232***	0.170*	0.183	0.193	0.174
	(0.391)	(0.000)	(0.014)	(0.024)	(0.066)	(0.098)	(0.127)	(0.147)	(0.167)
46-59 months	0.282	0.279***	0.241***	0.230***	0.257***	0.177*	0.182	0.190	0.172
	(0.386)	(0.013)	(0.014)	(0.024)	(0.067)	(0.090)	(0.130)	(0.149)	(0.170)
Female	-0.233	-0.073	-0.063	-0.062	-0.080	-0.072	-0.071	-0.080	-0.091
	(0.218)	(0.104)	(0.122)	(0.106)	(0.113)	(0.124)	(0.134)	(0.157)	(0.167)
Religion (Ref: Christian)									
Muslim	0.825	0.802	0.805	1.321	1.242	1.209	1.206	1.160	1.108
	(0.380)	(0.722)	(0.765)	(0.930)	(0.966)	(1.123)	(1.215)	(1.294)	(1.346)
Others	-0.358	-0.228	-0.241	0.232	0.274	0.244	0.245	0.170	0.157
	(1.111)	(0.240)	(0.264)	(0.253)	(0.256)	(0.253)	(0.293)	(0.127)	(0.150)
Ethnicity (Ref: Akan)									
Ga-Dangbe	0.380	0.174***	0.178***	0.291***	0.344***	0.359***	0.362***	0.466***	0.450**
	(0.553)	(0.011)	(0.015)	(0.032)	(0.033)	(0.062)	(0.108)	(0.148)	(0.174)
Ewe	0.259	-0.145***	-0.132***	-0.145***	-0.142***	-0.169***	-0.171**	-0.180	-0.177
	(0.444)	(0.012)	(0.015)	(0.018)	(0.026)	(0.049)	(0.086)	(0.117)	(0.138)
Guan	0.077	0.332***	0.331***	0.332***	0.284***	0.288***	0.282**	0.225	0.277
	(0.679)	(0.018)	(0.017)	(0.028)	(0.040)	(0.075)	(0.131)	(0.179)	(0.211)
Northern tribes	-0.752	-0.179***	-0.177***	-0.188***	-0.209***	-0.257***	-0.258**	-0.256	-0.145
	(0.608)	(0.016)	(0.027)	(0.034)	(0.037)	(0.068)	(0.119)	(0.162)	(0.191)

Table 6.7 Regression estimates of the relationship between women's social empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Others	-2.681***	-0.599***	-0.561***	-0.546***	-0.570***	-0.555***	-0.557***	-0.555**	-0.572**
	(0.845)	(0.022)	(0.019)	(0.029)	(0.050)	(0.094)	(0.163)	(0.223)	(0.262)
Child has health insurance	0.284**	0.204***	0.200***	0.133***	0.146***	0.147***	0.148***	0.131**	0.149**
	(0.141)	(0.005)	(0.014)	(0.023)	(0.015)	(0.027)	(0.048)	(0.065)	(0.068)
Mother's age	0.036	0.023***	0.022***	0.020***	0.021***	0.015*	0.016	0.017	0.013
	(0.031)	(0.002)	(0.003)	(0.006)	(0.006)	(0.008)	(0.016)	(0.018)	(0.060)
Mother's education (Ref: None)									
Primary	1.222**	0.551***	0.534***	0.528***	0.469***	0.380***	0.376***	0.226	0.165
	(0.530)	(0.000)	(0.006)	(0.014)	(0.032)	(0.059)	(0.103)	(0.140)	(0.165)
JSS/Middle School	1.409***	0.196***	0.187***	0.139***	0.087**	0.021	0.023	0.053	0.100
	(0.504)	(0.012)	(0.024)	(0.030)	(0.040)	(0.056)	(0.097)	(0.133)	(0.157)
Secondary	1.016*	0.382***	0.342***	0.335***	0.321***	0.312***	0.309***	0.193	0.151
	(0.608)	(0.037)	(0.047)	(0.056)	(0.056)	(0.067)	(0.117)	(0.160)	(0.189)
Higher	0.796	0.433***	0.422***	0.423***	0.325***	0.339***	0.338	0.272	0.334
	(1.074)	(0.015)	(0.024)	(0.028)	(0.063)	(0.118)	(0.206)	(0.281)	(0.331)
Mother's height	0.007*	0.005	0.005	0.005	0.007	0.005	0.007	0.007	0.008
	(0.004)	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)
Father's age	0.005	0.016***	0.015***	0.012***	0.011***	0.007***	0.007	0.008	0.004
	(0.023)	(0.002)	(0.001)	(0.001)	(0.001)	(0.003)	(0.005)	(0.006)	(0.007)
Father's education (Ref: None)									
Primary	1.082	0.364***	0.364***	0.364***	0.366***	0.373***	0.371***	0.394**	0.363*
	(0.683)	(0.029)	(0.038)	(0.048)	(0.061)	(0.076)	(0.132)	(0.181)	(0.213)
JSS/Middle School	1.445**	0.086***	0.082***	0.080***	0.078**	0.068	0.066	0.068	0.076
	(0.659)	(0.0170)	(0.027)	(0.028)	(0.039)	(0.073)	(0.128)	(0.174)	(0.205)
Secondary	2.094***	0.222***	0.217***	0.222***	0.247***	0.269***	0.268*	0.276	0.301
	(0.734)	(0.005)	(0.008)	(0.019)	(0.044)	(0.081)	(0.142)	(0.194)	(0.228)
Higher	1.573*	0.187***	0.158***	0.127***	0.083*	0.075	0.072	0.079	0.030
	(0.843)	(0.012)	(0.019)	(0.022)	(0.049)	(0.092)	(0.160)	(0.219)	(0.258)

Table 6.7 Regression estimates of the relationship between women's social empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Father's hours of work	0.006	0.007***	0.007***	0.007***	0.007***	0.008***	0.008***	0.008***	0.007***
	(0.005)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Father's height	0.058***	0.037***	0.038***	0.036***	0.037***	0.040***	0.040***	0.041***	0.041***
	(0.014)	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)	(0.004)	(0.004)
Expenditure Quintile (Ref: Lowest)									
Lower	0.082	0.030***	0.029***	0.028***	0.025	-0.060	-0.063	-0.074	-0.071
	(0.396)	(0.009)	(0.009)	(0.010)	(0.024)	(0.044)	(0.076)	(0.105)	(0.123)
Middle	0.052	0.055***	0.061***	0.051***	0.071***	0.161***	0.164**	0.206*	0.211
	(0.420)	(0.007)	(0.011)	(0.015)	(0.025)	(0.047)	(0.081)	(0.111)	(0.131)
Higher	0.076	0.065***	0.065***	0.054***	0.065**	-0.037	-0.039	-0.042	-0.053
	(0.424)	(0.012)	(0.015)	(0.021)	(0.025)	(0.047)	(0.082)	(0.112)	(0.132)
Highest	-0.365	0.240***	0.222***	0.210***	0.209***	0.319***	0.320***	0.326***	0.301**
	(0.462)	(0.016)	(0.015)	(0.022)	(0.027)	(0.051)	(0.089)	(0.122)	(0.143)
Household size	-0.082	-0.075	-0.056	-0.050	-0.045	-0.045	-0.046	-0.047	-0.043
	(0.132)	(0.610)	(0.070)	(0.064)	(0.058)	(0.055)	(0.056)	(0.035)	(0.041)
Drinking water (Ref: surface water)									
Unimproved water	0.723	0.680***	0.628***	0.598***	0.562***	0.568***	0.571***	0.545**	0.579**
	(0.840)	(0.011)	(0.019)	(0.022)	(0.050)	(0.093)	(0.162)	(0.222)	(0.262)
Non-piped improved	0.203	0.046***	0.042***	0.026**	0.005	0.004	0.007	0.079	0.131
	(0.376)	(0.012)	(0.014)	(0.020)	(0.022)	(0.042)	(0.073)	(0.100)	(0.117)
Piped outdoors	0.261	0.160***	0.154***	0.140***	0.120***	0.161***	0.157*	0.061	0.028
	(0.405)	(0.012)	(0.011)	(0.011)	(0.025)	(0.047)	(0.082)	(0.112)	(0.132)
Piped indoors	0.314	0.033***	0.027**	0.013	0.027	0.009	0.012	0.116	0.170
	(0.531)	(0.010)	(0.0013)	(0.014)	(0.032)	(0.060)	(0.105)	(0.144)	(0.169)
Improved toilet facility	0.194	0.032***	0.032***	0.032***	0.034**	0.021	0.019	0.037	0.019
	(0.247)	(0.000)	(0.003)	(0.007)	(0.015)	(0.027)	(0.048)	(0.065)	(0.076)
Radio	0.018	0.022	0.022	0.022	0.008	-0.010	-0.013	-0.024	-0.019
	(0.449)	(0.167)	(0.105)	(0.112)	(0.127)	(0.050)	(0.087)	(0.118)	(0.139)

Table 6.7 Regression estimates of the relationship between women's social empowerment and weight-for-height Z-scores among children under five (continued).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
Urban	0.057***	0.128***	0.106***	0.086***	0.081***	0.103***	0.112***	0.075	0.072
	(0.016)	(0.014)	(0.011)	(0.009)	(0.020)	(0.036)	(0.034)	(0.087)	(0.102)
Region (Ref: Greater Accra Region)									
Western Region	0.405	0.203***	0.199***	0.193***	0.243***	0.229***	0.233**	0.321**	0.333**
	(0.527)	(0.015)	(0.016)	(0.014)	(0.031)	(0.058)	(0.102)	(0.139)	(0.163)
Central Region	0.598	0.351***	0.351***	0.351***	0.404***	0.419***	0.422***	0.435***	0.458**
	(0.586)	(0.000)	(0.007)	(0.016)	(0.035)	(0.066)	(0.115)	(0.157)	(0.185)
Volta Region	0.316	0.597***	0.567***	0.597***	0.622***	0.550***	0.557***	0.619***	0.635***
	(0.568)	(0.000)	(0.006)	(0.015)	(0.034)	(0.064)	(0.111)	(0.152)	(0.179)
Eastern Region	0.470	0.052***	0.052***	0.052***	0.068**	0.031	0.032	0.028	0.042
	(0.559)	(0.000)	(0.006)	(0.015)	(0.033)	(0.062)	(0.108)	(0.148)	(0.174)
Ashanti Region	1.288**	0.530***	0.530***	0.530***	0.562***	0.522***	0.523***	0.584***	0.558***
	(0.524)	(0.000)	(0.006)	(0.014)	(0.031)	(0.057)	(0.099)	(0.136)	(0.160)
Brong Ahafo Region	1.805**	0.421***	0.421***	0.421***	0.454***	0.417***	0.419***	0.400**	0.391*
	(0.744)	(0.000)	(0.008)	(0.020)	(0.044)	(0.082)	(0.144)	(0.196)	(0.231)
Northern Region	0.104	0.430***	0.430***	0.430***	0.444***	0.412***	0.411***	0.413*	0.380
	(0.799)	(0.000)	(0.009)	(0.021)	(0.047)	(0.088)	(0.154)	(0.210)	(0.248)
Upper East Region	1.915*	0.381***	0.381***	0.381***	0.448***	0.318***	0.323*	0.547**	0.495
	(0.983)	(0.000)	(0.011)	(0.026)	(0.058)	(0.108)	(0.187)	(0.256)	(0.302)
Upper West Region	1.264	0.158***	0.158***	0.158***	0.203***	0.194*	0.193	0.190	0.119
	(1.037)	(0.000)	(0.011)	(0.028)	(0.062)	(0.116)	(0.202)	(0.276)	(0.325)
Constant	5.899***	2.556***	2.852***	2.812***	3.003***	3.496***	3.493***	3.008***	2.998***
	(2.906)	(0.000)	(0.032)	(0.077)	(0.173)	(0.321)	(0.560)	(0.765)	(0.901)
Observations	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518
Chi-squared		13.560	15.377	23.101		59.384	23.002	9.010	7.476
Prob		[0.077]	[0.066]	[0.000]		[0.000]	[0.000]	[0.325]	[0.470]

Robust standard errors in parentheses. P-values in []. *** p<0.01, ** p<0.05, * p<0.1.

6.3.3 Components of women's empowerment indices and child nutrition

To provide more insights into the effect of women's empowerment on children's health, both the women's social empowerment index and the women's economic empowerment index are decomposed into the sub-components, and their individual effects on the height-for-age and weight-for-height are estimated for the various quantiles. Table 6.8 and Table 6.9 present the effect of the sub-components of the two empowerment measures on the short-term and long-term nutritional status of children, respectively.

The results from Table 6.8 show that a mother's employment status is significant in increasing her child's height-for-age Z-scores, the indicator for long-term child health, among the undernourished children and those with normal status. Also, undernourished children and children with Z-scores between 0 and -2 whose mothers own at least a piece of land have significantly higher height-for-age Z-scores than undernourished children whose mothers have no land. Children with height-for-age Z-scores below -2 whose mothers have savings have higher Z-scores than those whose mothers have no savings. In addition to supporting earlier studies that found a positive relationship between maternal economic power and the health of children (Basu & Kaushik, 1991; Hoddinott & Haddad, 1995; Quisumbing & Maluccio, 2003), these findings show that economic empowerment of women could be a strong measure to improve the long-term health of stunted children.

With regards to the components of the social empowerment index, the OLS regression estimates in model 1 show that children whose mothers indicated that their partners do not restrict them from contacting their family members have about 0.2 units higher height-for-age Z-scores, compared to those whose parents restrict them from contacting their family. The quantile regression showed that this was the experience of children with height-for-age Z-scores below -1. Also, under-five children who fall within the undernourished (normal) quantiles whose

Table 6. 8 Decomposition of empowerment measures and the height-for-age Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
					Economic empowerment				
Mother is employed	0.061*	0.374***	0.383***	0.386***	0.387***	0.339***	0.292***	0.269*	0.203*
	(0.035)	(0.001)	(0.008)	(0.024)	(0.039)	(0.082)	(0.100)	(0.139)	(0.112)
Mother owns land	0.092	0.222***	0.224**	0.204***	0.217***	0.239	0.208	0.197	0.088
	(0.072)	(0.004)	(0.024)	(0.066)	(0.109)	(0.229)	(0.279)	(0.294)	(0.313)
Mother can borrow	0.065*	-0.000	-0.000	0.001	-0.016	0.049	0.048	0.033	0.038
	(0.039)	(0.003)	(0.018)	(0.050)	(0.082)	(0.172)	(0.209)	(0.221)	(0.235)
Mother has savings	0.099**	0.056***	0.055***	0.036	0.034	0.053	0.048	0.070	0.058
	(0.046)	(0.001)	(0.009)	(0.024)	(0.039)	(0.083)	(0.100)	(0.106)	(0.113)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,552	1,552	1,552	1,552	1,552	1,552	1,552	1,552	1,552
					Social empowerment				
Not acceptable to tolerate beating	0.073	0.167***	0.174***	0.209***	0.206***	0.204**	0.215*	0.212	0.174
	(0.069)	(0.011)	(0.014)	(0.024)	(0.066)	(0.089)	(0.128)	(0.147)	(0.167)
Family contact not limited by partner	0.203**	0.081***	0.076***	0.099***	0.049	0.033	0.057	0.046	0.042
	(0.091)	(0.016)	(0.018)	(0.031)	(0.086)	(0.116)	(0.167)	(0.192)	(0.219)
Not better to educate a son than a daughter	0.084	0.039	0.079	0.089*	0.085*	0.069	0.073	0.019	0.018
	(0.054)	(0.033)	(0.041)	(0.048)	(0.050)	(0.068)	(0.097)	(0.112)	(0.127)
Important decisions not made by only men	0.259***	0.554***	0.554***	0.442***	0.444***	0.442***	0.441**	0.294	0.212
	(0.090)	(0.000)	(0.018)	(0.031)	(0.086)	(0.116)	(0.166)	(0.191)	(0.218)
Partner not always demanding wife's location	-0.081	-0.229***	-0.229***	0.298***	-0.376**	-0.370	-0.382	-0.255	-0.119
	(0.202)	(0.000)	(0.040)	(0.069)	(0.191)	(0.258)	(0.371)	(0.426)	(0.485)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

OLS regression estimates in model 1; subsequent models are quantile regression estimates with the quantiles defined according to the nutritional status of children

mothers disagreed that a wife should tolerate being beaten by her husband to keep the family together had about 0.17-unit (0.21) higher Z-scores, compared to those whose mothers agreed. Considering whether or not a man must be the sole maker of important family decisions, the OLS estimates showed that disagreement with the statement was associated with a 0.26-unit improvement in the height-for-age Z-scores. Interestingly, the associated reduction in the height-for-age Z-scores is much higher for undernourished and normal-range children (0.55 units and about 0.44 units, respectively). Also, children with height-for-age Z-scores below 0 and whose mothers indicated that their partners did not always want to know their location had worse long-term health than those in the same quantiles whose mothers indicated otherwise.

From the social empowerment index components, it can also be observed that among the stunted children, those with socially empowered mothers tend to have higher Z-scores. This finding provides support for earlier works by Abekah-Nkrumah & Lawson (2020), Mbekenga *et al.* (2011), Smith *et al.* (2003) and Quisumbing (2003). Again, this finding supports the proposition that when elements of social norms (including putting up with violence, maternal nonparticipation in decision making and movement restrictions) are altered to enhance women's agency, it is even more beneficial for the more undernourished children.

Table 6.9 shows that maternal employment for undernourished and normal-range children whose Z-scores are less than -1 is associated with about 0.12-units to 0.14-units higher weight-for-height Z-scores. The magnitude of this effect is higher for undernourished children. Higher weight-for-height Z-scores are also observed for undernourished under-five children whose mothers have savings. Mother's ownership of land is also significantly associated with an increase in the short-term health status of children (weight-for-height Z-scores) among

Table 6. 9 Decomposition of empowerment measures and the weight-for-height Z-scores among children under five.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Undernourished			Normal			Over nourished	
VARIABLES	OLS	Z<=-3	-3<Z<=-2	-2<Z<=-1	-1<Z<=0	0<Z<=1	1<Z<=2	2<Z<=3	3<Z
					Economic empowerment				
Mother is employed	0.189	0.144***	0.128***	0.123***	0.112	0.118	0.072	0.046	-0.036
	(0.184)	(0.030)	(0.038)	(0.035)	(0.139)	(0.158)	(0.069)	(0.085)	(0.102)
Mother owns land	0.281	0.437***	0.422***	0.401***	0.374***	0.304*	0.178	-0.273	-0.290
	(0.376)	(0.069)	(0.092)	(0.083)	(0.108)	(0.161)	(0.190)	(0.235)	(0.282)
Mother can borrow	-0.737	0.029	0.027	0.026	-0.085	-0.032	-0.051	-0.081	-0.037
	(0.603)	(0.024)	(0.025)	(0.062)	(0.081)	(0.121)	(0.143)	(0.176)	(0.211)
Mother has savings	0.139	0.019***	0.017**	0.015	0.030	0.017	0.061	0.055	0.077
	(0.230)	(0.006)	(0.008)	(0.030)	(0.039)	(0.058)	(0.069)	(0.085)	(0.102)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518
					Social empowerment				
Not acceptable to tolerate beating	0.372	0.251***	0.233***	0.215***	0.209***	0.129***	0.130*	0.105	0.078
	(0.379)	(0.021)	(0.034)	(0.041)	(0.043)	(0.042)	(0.074)	(0.101)	(0.119)
Family contact not limited by partner	0.501*	0.279***	0.260***	0.260***	0.256***	0.257***	0.257***	0.245***	0.228***
	(0.259)	(0.023)	(0.027)	(0.036)	(0.036)	(0.039)	(0.051)	(0.069)	(0.082)
Not better to educate a son than a daughter	0.210	0.322***	0.113***	0.139***	0.148***	0.165***	0.164***	0.119	0.111
	(0.294)	(0.010)	(0.023)	(0.028)	(0.027)	(0.032)	(0.056)	(0.077)	(0.090)
Important decisions not made by only men	0.946***	0.546***	0.532***	0.527***	0.521***	0.480***	0.478***	0.380***	0.370**
	(0.396)	(0.017)	(0.013)	(0.030)	(0.042)	(0.055)	(0.096)	(0.132)	(0.155)
Partner not always demanding wife's location	-1.092	-0.077***	-0.066***	-0.059***	-0.022	-0.010	-0.008	-0.058	-0.108
	(1.102)	(0.000)	(0.018)	(0.021)	(0.066)	(0.123)	(0.214)	(0.292)	(0.344)
All other covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518	1,518

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

OLS regression estimates in model 1; subsequent models are quantile regression estimates with the quantiles defined according to the nutritional status of children

(weight-for-height Z-scores) among children in the undernourished range and normal-range children with Z-scores less than 0 (third and fourth quantiles).

Regarding the effect of the sub-components of social empowerment, fathers not being the sole decision-makers is associated with a 0.95-units increase in the weight-for-age Z-scores. Although the quantile regression estimates for decision making are lower than the OLS estimates, the lower quantiles or more malnourished children experienced much higher weight-for-age Z-scores increments. The quantile regression estimates also show that under-five children who fall within the first and second quantiles (undernourished children) whose mothers disagreed that a wife should tolerate beating by her husband to keep the family together had between 0.23-unit and 0.25-units higher Z-scores compared to those whose mothers agreed. Also, among under-five children within the normal quantiles and those with weight-for-height Z-scores between 1 and -2, having a mother who opposes wife-beating is associated with better short-term child health, and the estimates are higher for those in the lower quantiles.

Also, under-five children whose mothers noted that their partners did not try to limit them from contacting their family members had higher weight-for-height Z-scores across all the quantiles, with children in the lower quantiles recording much higher Z-scores than those in the higher quintiles. Also, under-five children with weight-for-age Z-scores below -1 and whose mothers indicated that their partners did not track their location are associated with lower weight-for-height Z-scores or worse short-term health statuses, compared to those in the same quantiles whose mothers always wanted to know their location.

6.3.4 Under-five nutrition and covariates

This section discusses the other independent variables in Tables 6.4, 6.5, 6.6 and 6.7. Compared to children below age one, older age categories are associated with lower height-for-age Z-

scores, especially for children within the first four quantiles at the 5 percent level of significance. Compared to children below age one, the height-for-height Z-scores tend to fall till a minimum is attained for children aged 24 to 35 months. After attaining this minimum, the weight-for-age Z-scores begin to rise for older categories. Many authors have found a negative association between child age and the long-term nutrition of children (Abekah-Nkrumah & Lawson, 2020; Kabubo-Mariara *et al*., 2009; Smith *et al*., 2003). This could be attributed to the weaning effect, as children tend to experience a dip in their immune systems and become more susceptible to infections immediately after weaning (Abekah-Nkrumah & Lawson, 2020).

With regard to the short-term health status of children, the effect of age is positive. Authors have found a positive association between child age and nutritional status (Priya Bhagowalia *et al*., 2010; Shroff *et al*., 2009). Abekah-Nkrumah & Lawson (2020) found a positive association between short-term child nutrition and age when children below age one are compared to those above two years of age. This could be explained by the increased levels of physical activity, both at home and in school, that may accompany children's growth. When children engage in healthy physical activities, they build stronger bones, cartilage and muscles (Faigenbaum, 2001). Also, physical activities help to release hormones that promote bone elongation and healthier growth (Gunter *et al*., 2012; MacGregor, 2008). Indeed, there is no significant improvement in their health statuses for children in the over nourished quantiles. This may be due to their reduced level of physical activity.

Compared to males in the undernourished height-for-age Z-score range, female children under five have 0.05-units (0.08) lower Z-scores, as shown in Table 6.4 (Table 6.5). Also, female children under five with less than -2 weight-for-age Z-scores are associated with between 0.06 to 0.08 units lower Z-scores. This means that among the malnourished children under five, females

are worse off in terms of both short-term and long-term health statuses. This finding partly contradicts earlier works in Ghana by Imai *et al.* (2014) and Essilfie, *et al*. (2020), who found female children to be more wasted than males and argued that males are more stunted than females using data from the GDHS. The data from GSEPS suggests that females are worse off in both stunting and wasting.

For children with height-for-age Z-scores below 0, the quantile regression estimates showed that having health insurance is associated with having between 0.11-units and 0.13-units higher Z-scores (see Table 6.4). Table 6.5 notes a similar relationship between insurance coverage and long-term child health, with the estimates ranging between 0.11 and 0.15. Both tables recorded higher estimates for the higher quantiles, meaning that when the more malnourished children are insured, they experience better long-term health outcomes. Regarding the short-term health of children under age five, insurance coverage is associated with improved weight-for-height Z-scores across all quantiles. This finding is aligned with that of Lu *et al.* (2016), Nuñez *et al.* (2016) and Nshakira-Rukundo *et al.* (2020), who noted a positive association between insurance coverage and child health status. Having health insurance coverage reduces out-of-pocket health expenditure and, therefore, improves the health outcomes of both children and mothers. This phenomenon translates into differences in the nutritional status of their respective children in Ghana. The National Health Insurance Scheme (NHIS), for instance, offers the poor a good chance to access healthcare for a small premium charge. This frees up resources that can be channelled into diverse forms of child investment, including child nutrition, even if the mother's financial capacity is low.

Table 6.4 (Table 6.5) shows that a unit increase in the mother's age is associated with between 0.008-units and 0.013-units (0.005-units and 0.013-units) higher height-for-age Z-scores for

children whose Z-scores are less than 0. Also, the effect of the mother's age on the short-term health status of children is positive and significant for children in the first four quintiles at the 5 percent level of significance. This result can be likened to that of Ganchimeg *et al.* (2014), Fall *et al.* (2015) and Wemakor *et al.* (2018), who found positive associations between mothers' age and the health status of their children.

Table 6.4, Table 6.5, Table 6.7 and Table 6.6, show that higher levels of maternal educational attainment compared to no education are positively associated with the short-term health of children under age five. Children in the lower quintiles recorded much higher magnitudes of effect. This confirms the importance of the educational attainment of a mother in improving the health status of her child, as found by Zakir and Wunnava (1999), Currie and Moretti (2003) and Andriano and Monden (2019). With regards to the long-term nutritional statuses of children, however, maternal attainment of JSS or middle school, secondary school and higher levels of education is positively associated with child nutrition for undernourished children and normal children with height-for-age Z-scores between 1 and -2 but negatively associated with Z-scores for over nourished children (see Table 6.4). Similar findings are observed for maternal primary, JSS, secondary and higher levels of education in Table 6.5. This finding confirms the works of Prickett & Augustine (2016) and Essilfie *et al.* (2020) who generally found that the educational attainment of mothers is associated with improvement in the long-term nutritional or health statuses of their children. Mothers with, at least primary education may possess the basic literacy and numeracy skills that can help them to engage in various forms of trade and also appreciate child health lessons in various media instruments. Such information may help mothers to tactfully invest in nutritional inputs to optimize the health of their children. Higher educational attainment also raises one's chances of being employed in one's preferred area of work. In

addition to the income gains that may be associated with higher levels of educational attainment, the job satisfaction and stability enjoyed when one works in the preferred areas of work can lead to productivity improvements, increased earnings and thus, increased availability of resources that can be invested in the feeding and the health of children.

Regarding the short-term nutritional status of children under age five, the height of mothers is not significantly associated with the health of children across all the quantiles. The mother's height is meant to capture the effect of the mother's genetic traits or health status on her child's health. The results suggest that a mother's genetic traits or health status positively correlates with that of her child in the long term, while no effect is recorded for the child's short-term health. This finding reaffirms the findings of Abekah-Nkrumah & Lawson (2020), Kabubo-Mariara *et al*. (2009) and Subramanian *et al*. (2009), who found a positive relationship between the height of mothers and the health and nutritional statuses of their children.

Table 6.6 (Table 6.7) shows that a unit increase in the father's age is associated with between 0.008-units and 0.013-units (0.005-units and 0.013-units) higher weight-for-age Z-scores for children whose Z-scores are less than 0. Older fathers are likely to be better equipped to take care of their children than younger fathers. Across all height-for-age Z-scores quantiles, children whose fathers have attained secondary and higher levels of education, compared to children whose fathers have no education, have better long-term health statuses (See Table 6.4). Regarding short-term health statuses of under-five children, paternal attainment of primary education, junior secondary education, senior secondary education and higher levels of education are all associated with higher weight-for-height Z-scores when compared with fathers with no education. Since educated fathers are better placed to earn more than fathers with no education,

they are more likely to afford and provide home environments that are more nurturing and helpful for child development (Ermisch & Pronzato, 2010; Schady, 2011).

The results show that father's hours of work is associated with higher height-for-age Z-scores, with an additional hour of work for a father being associated with between 0.002 and 0.003 height-for-age Z-scores for children whose height-for-age Z-scores are below 1 at the 5 percent significance level (see Table 6.4 and Table 6.5). Similarly, an increase in fathers' hours of work is associated with an improvement in the short-term health statuses of children. Also, Table 6.4 shows that a unit increase in the height of fathers is associated with between 0.012-units and 0.016-units higher Z-scores across all the quantiles. Being able to work for more hours is conventionally thought to increase one's earnings. A father who works for more hours can have more resources at his disposal, which can be used in purchasing the right proportion of food with all the required nutritional content. Furthermore, paternal height is also associated with improvement in the short-term health statuses of under-five children, with the magnitude ranging between 0.033 to 0.042 and 0.036 to 0.041 (see Table 6.6 and Table 6.7). Thus, the height of a father is positively associated with children's short-term and long-term health. Earlier research has shown that parents' height is a predictor of parental health status and can be passed on to a child (Alderman *et al*., 2006; Coneus & Spiess, 2012).

From Table 6.4 and Table 6.5, malnourished under-five children whose households are found in higher expenditure quintiles compared to those in the first quintile have better long-term health statuses. However, in the short term, children in the highest real expenditure quintile had better health statuses than those in the lowest quintile, which was true for all the weight-for-age quantiles (see Table 6.6). It is worth noting that higher wealth quintiles recorded higher estimates than those in the lower quintiles. These findings suggest that under-five children whose

households spend more than those who spend less have better nutritional statuses. This finding corroborates Wamani *et al.* (2007) and Eshete *et al.* (2017), who found that children within higher wealth quintiles are associated with better nutritional statuses.

Household size is negatively associated with the long-term health or nutritional status of children. This relationship is significant at 1 percent for undernourished children. Generally, one expects that when there are many individuals in a household, resources to finance inputs for welfare investments may not be enough, especially in poorer households. The implication could be reduced ability of households to provide adequate nutrition for the household members, with adverse implications for their nutrition and health (Smith *et al.*, 2003; Kabubo-Mariara *et al.*, 2009)

Regarding the height-for-age Z-scores (see Table 6.5), under-five children who drink from improved piped water and non-piped water sources and whose Z-scores are below -1 have higher Z-scores than those who drink from surface water sources. From Table 6.4, compared to under-five children who drink from surface water sources, those who drink from both outdoor and indoor pipe-borne water sources and whose Z-scores are less than -2 have better long-term health statuses. Table 6.6 shows that under-five children who are either normal or undernourished and who drink from indoor piped sources have better short-term health. Drinking from quality water sources has implications for the health of a child. Surface water may contain disease-causing organisms that put the child at risk of contracting diseases such as E-coli, typhoid fever, dysentery and guinea worm. Thus, drinking from unimproved sources may affect the health status and growth of children and other family members. Access to improved quality water reduces the rate of infections and diseases in children, thus, promoting their healthy growth.

The first three short-term nutrition quantiles show that compared to under-five children who use unimproved toilet facilities, those who use improved toilet facilities have better health statuses at 1 percent significance level (see Table 6.6 and Table 6.7). Also, children in the fourth quantile who use improved toilet facilities have better short-term health statuses than those who use unimproved toilet facilities. Similarly, children in the first four height-for-age quantiles who use improved toilet facilities can be associated with better long-term health when compared with those who use unimproved toilet facilities. This finding ties in with the UNICEF framework for child nutrition, which argues the lack of access to improved sanitation is a rudimentary cause of disability and death. Prior studies have found a positive relationship between access to good water and sanitation and child health (Bassolé, 2007; Pongou *et al*., 2006; K. R. Smith & Mehta, 2003).

6.3.5 Summary of the main findings

This chapter presented and discussed the effect of women's empowerment on under-five children's long-term and short-term nutritional status. The descriptive results show that the average under-five child falls within the normal range of short-term and long-term health. The results show that the components of the measures of maternal empowerment differed significantly for undernourished, normal and over nourished children, thus, justifying the usage of the quantile regression estimation technique. Also, there were noticeable differences between the OLS estimates and the quantile regression estimates, with the latter providing the estimated effect at various points of the distribution of child health.

The results show a positive relationship between the economic empowerment of women and the long-term health of their children. The magnitude of the effect is more substantial for undernourished children. When the women's empowerment measure is decomposed into the sub-

components, it is observed that maternal employment status, land ownership and savings are all associated with improved long-term child health. Similarly, the social empowerment of women is significantly associated with improved short-term child health, particularly for children within the first four quantiles (i.e., stunted children and the proportion of normal children who have negative Z-scores. Results from the decomposition of the sub-components of the social empowerment measure indicated that the long-term health status of children is enhanced when a mother or wife participates in important decisions and family contact is not restricted.

While women's economic empowerment has a strong positive effect on the short-term nutrition status of undernourished children, social empowerment of women is observed to have a greater effect on the short-term health status of both the undernourished and normal children below age five. Notably, undernourished children whose mothers have at least primary education are seen to be healthier than those with uneducated mothers, while their over nourished counterparts had reduced Z-scores (as they were either too tall or had too much weight for their height). This chapter, therefore, found that women's empowerment is a strong measure that can improve the health of children, and the effect is stronger for undernourished children.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter is fashioned into four sections. Section 7.1 introduces the chapter, while section 7.2 summarizes and concludes the study. Section 7.3 presents the study's contribution to empirics and practice (recommendations). In section 7.4, the limitations of the study are indicated. Finally, section 7.5 outlines areas that call for future research efforts.

7.2 Summary of findings and conclusion

This thesis examined the relationship between women's empowerment and welfare or economic development using macro and micro evidence from Africa, focusing on three critical themes. First, this study examined the effect of women's political empowerment on the income and non-income components of welfare or economic development using a sample of 38 African countries. Second, the study examined the effect of women's empowerment on children's cognitive development and academic achievement in Ghana. The thesis examined the relationship between women's empowerment and the nutritional status of children in Ghana, factoring in the conditional distribution of child nutrition. This study, therefore, focused on prominent gaps in the women's empowerment-welfare linkage that have been relatively understudied. Through this thesis, answers are given to the following research questions:

i. What is the effect of women's political empowerment on welfare among African countries?

ii. What is the extent to which the economic and social empowerment of women affects the cognitive development and academic performance of their wards?

iii. What is the relationship between women's economic and social empowerment and children's nutritional status in Ghana?

Thematically, the summary and key findings are highlighted below:

7.2.1 Effect of women's political empowerment on welfare in Africa

This study concludes that giving women access to resources may not be as development-enhancing as women's control over resources. The existing literature generally strongly associates increased female representation in national parliaments with increased investment in health and education. However, the political empowerment of women is broader and transcends the proportion of women in national parliaments. This study uses an improved measure of the political empowerment of women, i.e., the Women's Political Empowerment Index, for the analysis. Furthermore, the literature has not adequately differentiated between income and non-income measures of welfare, nor has there been an emphasis on the African continent in this regard. The study provides evidence (from Africa) to examine the relationship between the political empowerment of women and income and non-income welfare outcomes, which may have contributed differently to welfare outcomes over time (Fosu & Mwabu, 2010). The income and non-income measures of welfare are separately considered as women's political empowerment may impact them through different transmission mechanisms. The non-income welfare measure used is also intertemporally comparable, thus, overcoming a major drawback of the conventional HDI index.

This study, therefore, carries out a cross-national investigation of the effect of women's political empowerment on both the income and non-income components of welfare in African countries. The latest measures of political empowerment are employed in this study. The thesis uses data from different sources including the Quality of Governance dataset, the Centre for Systemic

Peace database, the Varieties of Democracy dataset, the World Bank Governance Indicators, the World Development Indicators and the Ghana Socioeconomic Panel Survey data. To estimate the effect of women's political empowerment on welfare, the study employed 2SLS-FE as the most appropriate econometric technique. Additionally, the ratio of lagged property rights to women to the legal origin of the sampled countries is employed as an instrument to accurately deal with possible endogeneity between women's empowerment and welfare. In addition, predicted values of economic growth (which could be presumed exogenous) are used in the estimations.

The results show that the political empowerment of women has a significant positive effect on both the non-income measure of welfare (defined as HD) and household income. The results indicate, as well, that economic growth, government expenditure, urbanization as well as access to improved water and sanitation significantly influence the levels of welfare attained by individuals. This result was found to be fairly robust when system-GMM is used as an alternate estimation technique.

7.2.2 Effect of women's empowerment on the cognitive development and academic achievement of children in Ghana

Cognitive development predicts academic performance, future educational attainment and earnings. However, it has not received adequate attention in developing countries relative to developed ones. Not being an exception, Ghana faces significant challenges in cognitive development and academic performance, performing below par. In Ghana, a one standard deviation increment in academic test scores is said to increase lifetime income by 17.8 percent (Evans & Yuan, 2017). The literature has provided extensive evidence on the effect that mothers' empowerment status has on child outcomes, including school enrolment and other health

benefits. However, the evidence on the relationship between mothers' empowerment and schooling outcomes has mostly focused on school enrolment. The cognitive development and academic performance of wards have received little attention for Ghana, in particular, although they are much better measures of the quality of learning.

Moreover, the literature has not paid much attention to whether and how the different dimensions of empowerment (herein, women's social empowerment and women's economic empowerment) affect wards' cognitive development and academic performance. This is crucial as the empowerment status of a mother may affect the wards' intellectual capacity development via the level of investment in the wards' schooling. Another crucial factor is how existing social norms, beliefs and practices inform the agency of women and enable them to table their preferences when investment decisions are being made. Aspects of empowerment that may affect the physical and psychological health of mothers and, therefore, affect the quality of mother-child interaction have been mostly ignored in the existing analysis. Also, most existing studies have assessed associations between maternal empowerment and child outcomes using cross-sectional data and ignoring the possible effect of unobserved heterogeneity, which may affect both child learning and parental intellectual abilities.

This study, therefore, examines the effect of mothers' empowerment status and cognitive development and academic performance of their wards. This study employs the first two waves of the GSEPS data and panel Tobit estimation method for its analysis. The richness of the data affords the use of the Digit-span cognitive test and mathematics and English language tests scores, which are the outcome variables that are regressed on the measures of empowerment, characteristics of the children, mothers, fathers and household characteristics. Composite indexes are employed as measures of maternal economic empowerment and social empowerment of

women. After the Hausman test shows that the possible unobserved heterogeneity that could influence both the test scores and parental characteristics such as abilities and attitudes are not strongly correlated to the covariates, the random effect estimation technique is deemed appropriate. Besides, a panel Tobit technique is employed to address possible downward bias in the estimates due to the censored nature of the data, as many respondents scored zero in some of the tests. To control for the possible clustered nature of the inputs of learning in more urbanized areas or regions, regional dummies and locality are controlled for in all regressions.

The results indicate that the economic empowerment of a mother positively affects the cognitive development and mathematics test scores of her children or wards. Wards of socially empowered mothers also performed better on both the digit-span cognitive test and mathematics tests. Other factors that affect the cognitive development and academic performance of wards are the age of wards, nutrition status, attendance of public school, access to textbooks, attainment of secondary school education by mothers, father's working hours, drinking from improved water sources, usage of improved toilet facility and household expenditure.

7.2.3 The relationship between women's economic empowerment and child nutrition in Ghana

Poor nutrition is associated with adverse economic growth and perpetual poverty due to direct loss of productivity emanating from weak physical status and indirect loss from poor cognitive development and increased health care costs. Malnutrition has become endemic in Africa, as 23 percent of children are still stunted and 57 percent are anaemic. More recent evidence from the WDI data as of 2017 suggests that Ghana has 12.6 percent prevalence of underweight, 6.8 percent wasting and 17.5 percent stunting among all children under five years. The literature has

tackled chiefly only one aspect of malnutrition (undernutrition) while over nutrition has not been adequately tackled regardless of its upward trend in both developed and developing countries.

Studies on the effect of women's empowerment on child nutrition in Ghana are limited, nevertheless. In the existing literature, the bargaining power of a mother is abstract and has been proxied by measures such as educational attainment relative to that of the husband, autonomy in decision making and freedom of movement and association. These measures, however, do not adequately capture the multidimensionality of women's empowerment. Also, social norms, beliefs, practices and institutions affect the agency of women in Africa (and Ghana to be specific) than the fear of marital breakdown (the threat point in household bargaining) as opined by existing theories of women's empowerment and household resource allocation.

This study examines the effect of mothers' economic and social empowerment on the long-term and short-term health status of children. Economic empowerment of mothers is proxied by a composite index, which is obtained by predicting the principal components of measures of a woman's access to and control over resources such as her employment status, her access to loans, her ability to save money and her land ownership status. Social empowerment is also measured using an index which is the principal component of five input elements (tolerating beating to keep a woman's family, limiting a woman's contact with her family, son preference, decision-making participation, and whether a woman is always required to declare her location to her husband). The individual components are also used in separate estimations to tease out their individual effects on the nutritional status of children. An essential contribution to the literature is the use of the GSEPS dataset, which is nationally representative and contains variables that are not found in the widely used GDHS data. The study uses quantile regression estimations to

examine how economic empowerment may affect children with different levels of nutrition, i.e., undernourished, normal and over nourished children.

The results show a positive relationship between the economic empowerment of women and the long-term health of their children. The magnitude of the effect is more substantial for undernourished children. Also, maternal employment status, land ownership and savings are all associated with improved long-term child health. The social empowerment of women is positively associated with improved short-term child health, particularly for children with poor nutritional or health status. Results from the decomposition of the sub-components of the social empowerment measure indicated that the long-term health status of children is enhanced when a mother or wife participates in important decisions and family contact is not restricted. Notably, undernourished and over nourished children whose mothers have at least primary education are seen to be healthier than those children whose mothers are uneducated.

7.3 Contributions to knowledge

This study should add severally to the literature: empirics, methodology and practice. Each of these contributions is discussed below.

7.3.1 Contribution to empirics

This study presents empirical evidence on how women's political empowerment affects the income and non-income components of welfare in Africa. To the best of the researcher's knowledge, this study is the first attempt to estimate such a causal effect specifically for African countries. The thesis gives insights into how the empowerment of women affects the cognitive development and academic achievement of children. The study, based on the household cooperative bargaining theory, the investment theory and the family stress theory, sought to

assess how the various facets of empowerment influence the quality of learning of wards. Moreover, the study examines the relationship between women's economic empowerment and child nutrition. It focuses on both undernutrition and over nutrition, allowing for different impacts for children with varying nutritional statuses.

7.3.2 Contribution to methodology

It is important to note that the empirical chapters are self–contained. As such, this thesis uses different methodologies due to the unique nature of each chapter. Indeed, the present study uses a panel setup and applies systematic approaches to provide reliable estimates for the impacts of women's empowerment.

The study further uses improved measures of political empowerment of women. Also, most existing studies on Ghana used the Demographic and Health Survey database which lacks data for some important variables such as parents' hours of work, household expenditure and savings which are employed in the present study based on data from the Ghana Socioeconomic Panel Survey. In the light of some criticisms levelled against the HDI index (i.e., the HDI index measures relative changes in the index and not actual changes and it is difficult to compare across time), the non-income HD measure has a fixed reference point which fosters easy comparison across time, thus, overcoming a major criticism of the HDI index.

7.3.3 Contribution to practice (policy recommendations)

The evidence presented in this study suggests that improvements in women's political empowerment enhance the welfare of individuals in African countries. The study recommends capacity-building efforts spearheaded by women's associations, civil society organisations and

other private individuals to improve the capacity of women to take up political positions. Such activities may include education and training to improve the confidence and competence of women. The study encourages women to participate in civil society organisations as they are platforms to project women's voices and agency. Civil society organisations can also champion sustaining and improving women's political participation by organising leadership and political training (purposive capacity building). Governments must also strengthen the legal frameworks that protect and secure women's rights and use affirmative action policies or quotas to get women involved, where necessary. A caution, however, is that competence and capability must not be compromised for affirmative action. Instead, women selected through affirmative action must prove themselves fit for duty.

The findings indicated that women's empowerment enhances the quality of learning of their children or wards. Women's economic empowerment enhances investment in inputs that promote wards' welfare, leading to much-improved learning and health outcomes. This effect is mainly driven by a mother's employment status, her ability to save and land ownership. Females should take advantage of current policies such as free primary and secondary education to build their capacity to compete for jobs in future. Also, the government and non-governmental organisations can spearhead the provision of professional and entrepreneurial training programmes that target both employed and unemployed mothers. Besides, the labour laws of Ghana (Sections 55-56, 57(8), 63(2)(e) and 118 of the Labour Act 2003 (Act 651)) give women the flexibility to work and ensure that they are not discriminated against due to pregnancy or absence from work during maternity leave periods. In addition to ensuring the implementation of labour laws, working conditions must be improved at various workplaces to encourage women to work.

It is important to note that a wife's decision to work in traditional society is often subject to her husband's approval. In addition, the importance of women's contribution to the resources available for child welfare investment is crucial and must prompt a change from the backward culture that prevents women from working. Women must be encouraged and educated on the need and avenues to save their earnings to smooth expenditures and investments in children. Also, the institutional frameworks that guide land ownership in a typical Ghanaian society are more favourable to men (family heads and traditional leaders) who often have control over land. Women must be encouraged and supported by their husbands to purchase and own land. Also, the Intestate Succession Law must be upheld in guaranteeing the right of inheritance for a surviving spouse, children, the customary family and parents and ensuring that a greater portion of the property is shared among the surviving spouse and children.

The results also show that maternal social empowerment enhances the quality of learning of wards. The findings also show that when social norms, beliefs and traditions give women more agency, their children tend to be healthier. This means that the total effect of women's empowerment on child health outcomes could be much higher than when due attention is given to women's economic empowerment. Embarking on more education to draw attention to how social norms, when favourable to women's agency, could complement policies that aim to enhance women's access to resources is crucial.

The findings also point to the positive effect of couples' decision-making made by couples together, compared to when the decisions are made by the man alone. The study suggests that household decisions and choices must inculcate the opinion and choices of women as well as the development of meaningful family ties that could serve as an additional source of informal education and social support in difficult times. Notably, the educational levels of fathers have a

strong positive effect on the mathematics test scores of wards. This finding suggests that efforts to empower women must be implemented to make resources accessible to all (both men and women) and more equitably distributed. Thus, both men and women must take advantage of available resources and social norms to enhance their productivity, earnings, and to optimise their investment into the educational inputs needed by their wards.

7.4 Limitations of the study

First, the empirical examination of the effect of women's political empowerment on household income and the non-income welfare measure employed data from many different sources. It must be noted that these datasets differ in terms of the sampling and methods used in their collection and could, thus potentially, affect the results. However, it was necessary to include all the variables employed in order not to bias the results and to have the best approximation to reality. To go around this challenge, the author investigated the various methods that were used in the collection of the data and was satisfied that they could be used without affecting the validity of the results.

Second, other dimensions of women's empowerment such as the legal empowerment and the psychological empowerment of women are not considered in the study. This is due to data availability and consistency.

7.5 Areas Necessitating Further Research Efforts

Here are three important areas that require further research. First, it would be interesting to examine the determinants of empowerment and complement the findings with that of the present study. The present study was focused on examining the impact of women's empowerment on welfare; much clarity will be achieved if the determinants of empowerment are also known. It

would be interesting to compare, for instance, the determinants of political empowerment of women using a wider sample and estimating the coefficients for different regional blocks or for Arab countries.

Second, due to the enormity of heterogeneity in the effect of women's political empowerment on welfare, it would be instructive to conduct separate country studies to assess how each country's idiosyncratic political undertone could affect the results. The major challenge in such studies is the availability of data to tease out appropriate measures of political empowerment of women, especially, at the micro level. Data-collection efforts could be beefed-up in this regard.

Third, since different forms of empowerment can affect welfare outcomes directly and indirectly (interactively), future studies could examine how different forms of women's empowerment affect welfare outcomes both directly (individually) and indirectly (interactively). This would broaden the understanding of the intricate effects of women's empowerment and facilitate much-improved policy suggestions.

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APPENDICES

APPENDIX A: Non-income measure of welfare (HD)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Algeria	0.554	0.563	0.571	0.581	0.590	0.596	0.610	0.623	0.636	0.650	0.663	0.676	0.693	0.706
Benin	0.298	0.309	0.317	0.324	0.330	0.334	0.338	0.340	0.346	0.352	0.360	0.374	0.388	0.399
Botswana	0.547	0.549	0.542	0.530	0.518	0.510	0.498	0.488	0.481	0.478	0.476	0.477	0.483	0.493
Burundi	0.216	0.218	0.214	0.220	0.225	0.232	0.239	0.247	0.254	0.260	0.264	0.267	0.277	0.289
Cameroon	0.364	0.362	0.356	0.353	0.348	0.346	0.341	0.340	0.349	0.343	0.352	0.381	0.387	0.395
CAR	0.251	0.242	0.227	0.225	0.222	0.220	0.217	0.216	0.215	0.215	0.215	0.215	0.219	0.224
Congo	0.477	0.471	0.468	0.460	0.456	0.448	0.443	0.436	0.431	0.427	0.424	0.426	0.430	0.435
Congo, DR	0.284	0.286	0.290	0.294	0.293	0.294	0.297	0.301	0.304	0.311	0.319	0.333	0.346	0.360
Cote d'Ivoire	0.302	0.301	0.299	0.296	0.290	0.285	0.280	0.278	0.272	0.275	0.279	0.281	0.285	0.293
Egypt	0.532	0.538	0.546	0.556	0.567	0.577	0.590	0.598	0.601	0.617	0.625	0.631	0.639	0.642
Gabon	0.543	0.549	0.553	0.557	0.557	0.558	0.562	0.563	0.565	0.566	0.570	0.571	0.575	0.578
Gambia	0.269	0.278	0.283	0.290	0.297	0.304	0.314	0.324	0.334	0.345	0.354	0.364	0.374	0.385
Ghana	0.438	0.447	0.451	0.459	0.461	0.464	0.464	0.463	0.463	0.465	0.472	0.468	0.477	0.480
Guinea	0.207	0.216	0.223	0.231	0.236	0.239	0.244	0.248	0.252	0.258	0.264	0.270	0.280	0.272
Kenya	0.445	0.441	0.434	0.429	0.424	0.415	0.410	0.405	0.402	0.399	0.404	0.409	0.413	0.436
Lesotho	0.487	0.494	0.493	0.482	0.482	0.470	0.454	0.434	0.414	0.393	0.388	0.379	0.373	0.372
Libya	0.650	0.662	0.671	0.679	0.690	0.697	0.706	0.713	0.720	0.729	0.738	0.745	0.752	0.757
Malawi	0.238	0.241	0.261	0.266	0.272	0.327	0.325	0.325	0.329	0.331	0.321	0.330	0.338	0.343
Mali	0.137	0.143	0.149	0.153	0.161	0.166	0.174	0.181	0.192	0.203	0.215	0.230	0.244	0.261
Mauritania	0.336	0.343	0.353	0.365	0.379	0.385	0.394	0.397	0.406	0.412	0.416	0.417	0.422	0.428
Mauritius	0.643	0.650	0.658	0.664	0.671	0.677	0.677	0.682	0.689	0.696	0.701	0.713	0.722	0.733
Morocco	0.452	0.461	0.469	0.479	0.491	0.501	0.509	0.518	0.524	0.537	0.554	0.567	0.583	0.596
Mozambique	0.134	0.141	0.146	0.154	0.166	0.181	0.198	0.215	0.229	0.243	0.257	0.275	0.291	0.304
Namibia	0.562	0.563	0.569	0.574	0.578	0.568	0.553	0.542	0.529	0.513	0.506	0.503	0.494	0.489
Niger	0.112	0.119	0.129	0.138	0.147	0.157	0.165	0.177	0.185	0.197	0.205	0.212	0.222	0.232
Rwanda	0.090	0.049	0.025	0.023	0.041	0.078	0.123	0.172	0.209	0.253	0.283	0.303	0.325	0.351
Sao Tome and Principe	0.462	0.468	0.473	0.482	0.488	0.493	0.501	0.508	0.512	0.520	0.525	0.533	0.538	0.544
Senegal	0.335	0.338	0.338	0.340	0.340	0.341	0.339	0.341	0.343	0.344	0.351	0.368	0.379	0.390
Sierra Leone	0.107	0.098	0.097	0.101	0.104	0.111	0.118	0.129	0.142	0.155	0.172	0.188	0.205	0.219
South Africa	0.593	0.604	0.624	0.635	0.641	0.644	0.638	0.630	0.620	0.613	0.602	0.562	0.572	0.569
Sudan	0.292	0.300	0.307	0.313	0.322	0.331	0.339	0.348	0.356	0.364	0.371	0.379	0.387	0.396
Swaziland	0.496	0.496	0.491	0.482	0.471	0.453	0.435	0.413	0.392	0.371	0.352	0.334	0.320	0.316
Tanzania	0.303	0.304	0.301	0.303	0.302	0.304	0.305	0.310	0.320	0.330	0.341	0.357	0.372	0.389
Togo	0.388	0.395	0.385	0.387	0.384	0.398	0.402	0.403	0.405	0.408	0.412	0.418	0.424	0.428
Tunisia	0.588	0.600	0.611	0.624	0.638	0.651	0.663	0.669	0.686	0.698	0.711	0.721	0.728	0.736
Uganda	0.237	0.235	0.222	0.228	0.230	0.233	0.254	0.279	0.304	0.333	0.361	0.378	0.402	0.419
Zambia	0.300	0.303	0.307	0.313	0.319	0.327	0.330	0.335	0.340	0.350	0.360	0.373	0.388	0.404
Zimbabwe	0.478	0.475	0.457	0.446	0.432	0.419	0.407	0.397	0.386	0.378	0.373	0.375	0.369	0.363

Welfare measure cont'd

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Algeria	0.720	0.735	0.742	0.755	0.757	0.774	0.788	0.802	0.809	0.815	0.820	0.823	0.827	0.831
Benin	0.411	0.425	0.436	0.449	0.460	0.468	0.478	0.488	0.505	0.521	0.526	0.533	0.538	0.542
Botswana	0.508	0.528	0.550	0.570	0.591	0.615	0.634	0.650	0.668	0.683	0.699	0.710	0.723	0.732
Burundi	0.300	0.310	0.338	0.354	0.372	0.399	0.416	0.429	0.438	0.451	0.460	0.467	0.473	0.478
Cameroon	0.403	0.408	0.420	0.439	0.451	0.465	0.478	0.493	0.512	0.528	0.539	0.547	0.557	0.562
CAR	0.233	0.241	0.250	0.260	0.269	0.282	0.295	0.308	0.318	0.333	0.344	0.355	0.368	0.375
Congo	0.450	0.466	0.485	0.501	0.522	0.538	0.555	0.565	0.574	0.587	0.597	0.607	0.616	0.622
Congo, DR	0.374	0.389	0.403	0.419	0.441	0.454	0.469	0.484	0.492	0.504	0.517	0.529	0.537	0.549
Cote d'Ivoire	0.302	0.311	0.322	0.333	0.344	0.356	0.367	0.378	0.388	0.400	0.399	0.418	0.429	0.437
Egypt	0.650	0.657	0.667	0.676	0.684	0.687	0.695	0.700	0.711	0.720	0.725	0.735	0.740	0.742
Gabon	0.586	0.593	0.600	0.611	0.620	0.630	0.642	0.651	0.660	0.674	0.680	0.686	0.692	0.700
Gambia	0.395	0.406	0.418	0.424	0.436	0.440	0.443	0.450	0.460	0.470	0.474	0.480	0.482	0.486
Ghana	0.493	0.508	0.523	0.540	0.556	0.564	0.575	0.583	0.592	0.600	0.599	0.609	0.615	0.618
Guinea	0.304	0.321	0.338	0.352	0.363	0.374	0.382	0.401	0.415	0.428	0.437	0.444	0.450	0.457
Kenya	0.458	0.475	0.505	0.521	0.542	0.565	0.582	0.599	0.613	0.627	0.636	0.645	0.653	0.662
Lesotho	0.375	0.382	0.391	0.405	0.415	0.437	0.441	0.453	0.465	0.467	0.475	0.477	0.487	0.492
Libya	0.760	0.760	0.760	0.760	0.762	0.760	0.758	0.753	0.748	0.748	0.749	0.750	0.751	0.753
Malawi	0.345	0.358	0.378	0.396	0.426	0.451	0.475	0.492	0.507	0.525	0.535	0.544	0.553	0.559
Mali	0.277	0.294	0.307	0.308	0.338	0.350	0.360	0.367	0.372	0.376	0.384	0.390	0.396	0.404
Mauritania	0.438	0.444	0.450	0.451	0.455	0.468	0.473	0.480	0.491	0.500	0.510	0.512	0.515	0.520
Mauritius	0.743	0.755	0.763	0.771	0.779	0.790	0.799	0.811	0.825	0.833	0.848	0.847	0.852	0.854
Morocco	0.608	0.622	0.630	0.641	0.651	0.662	0.673	0.686	0.700	0.711	0.720	0.727	0.739	0.744
Mozambique	0.323	0.343	0.355	0.375	0.391	0.400	0.412	0.414	0.421	0.438	0.444	0.453	0.460	0.467
Namibia	0.487	0.487	0.490	0.502	0.513	0.531	0.551	0.572	0.591	0.608	0.621	0.630	0.639	0.644
Niger	0.245	0.256	0.267	0.280	0.294	0.305	0.318	0.332	0.347	0.355	0.360	0.368	0.376	0.382
Rwanda	0.380	0.408	0.443	0.472	0.489	0.518	0.543	0.557	0.567	0.574	0.583	0.582	0.595	0.600
Sao Tome and Principe	0.550	0.559	0.565	0.571	0.572	0.584	0.589	0.595	0.601	0.611	0.620	0.641	0.650	0.659
Senegal	0.401	0.411	0.423	0.436	0.451	0.462	0.475	0.491	0.506	0.517	0.526	0.536	0.542	0.552
Sierra Leone	0.236	0.251	0.268	0.280	0.295	0.310	0.326	0.338	0.352	0.364	0.371	0.377	0.385	0.393
South Africa	0.562	0.561	0.563	0.570	0.588	0.608	0.619	0.632	0.646	0.665	0.684	0.697	0.706	0.713
Sudan	0.407	0.417	0.428	0.431	0.445	0.456	0.460	0.460	0.472	0.479	0.484	0.490	0.494	0.498
Swaziland	0.332	0.349	0.376	0.395	0.414	0.436	0.455	0.474	0.493	0.509	0.525	0.533	0.541	0.547
Tanzania	0.407	0.429	0.445	0.463	0.480	0.494	0.507	0.516	0.534	0.533	0.548	0.569	0.577	0.584
Togo	0.435	0.441	0.454	0.453	0.468	0.481	0.497	0.512	0.522	0.533	0.542	0.547	0.552	0.556
Tunisia	0.747	0.759	0.765	0.770	0.777	0.780	0.789	0.796	0.797	0.801	0.802	0.810	0.817	0.822
Uganda	0.417	0.431	0.448	0.465	0.485	0.494	0.515	0.515	0.520	0.528	0.536	0.545	0.550	0.566
Zambia	0.422	0.441	0.461	0.481	0.502	0.522	0.543	0.565	0.580	0.593	0.604	0.611	0.619	0.623
Zimbabwe	0.369	0.380	0.393	0.414	0.436	0.461	0.486	0.502	0.541	0.560	0.580	0.591	0.600	0.605

APPENDIX B1 Breusch-Pagan LM test and Hausman tests performed in Chapter 4

Breusch and Pagan Lagrangian multiplier test for random effects

HD [cid,t] = Xb + u[cid] + e[cid,t]

Estimated results:

Var	sd = sqrt(Var)
hd_ch	.0081741 .090411
e	.0006074 .0246451
u	.0032056 .0566178

Test: Var(u) = 0
chibar2(01) = 15.45
Prob > chibar2 = 0.0000

Hausman Test 1 (Corresponds with Hausman test in Table 4.2)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 32.44

Prob>chi2 = 0.0012

(V_b-V_B is not positive definite)

Hausman Test 2 (Corresponds with Hausman test in Table 4.3)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 54.85

Prob>chi2 = 0.0000

(V_b-V_B is not positive definite)

APPENDIX B2 Hausman tests performed in Chapter 5

Hausman Test 3 (Corresponds with Hausman test in Table 5.2)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 2.244

Prob>chi2 = 0.247

(V_b-V_B is not positive definite)

Hausman Test 4 (Corresponds with Hausman test in Table 5.2)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.854

Prob>chi2 = 0.742

(V_b-V_B is not positive definite)

Hausman Test 5 (Corresponds with Hausman test in Table 5.4)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 4.196

Prob>chi2 = 0.166

(V_b-V_B is not positive definite)

Hausman Test 6 (Corresponds with Hausman test in Table 5.4)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.927

Prob>chi2 = 0.732

(V_b-V_B is not positive definite)

Hausman Test 7 (Corresponds with Hausman test in Table 5.5)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 2.004

Prob>chi2 = 0.574

(V_b-V_B is not positive definite)

Hausman Test 8 (Corresponds with Hausman test in Table 5.5)

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(40) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 1.993

Prob>chi2 = 0.668

(V_b-V_B is not positive definite)

APPENDIX C Measures of women's empowerment

Background

Two broad dimensions of women's empowerment, i.e., economic empowerment and social empowerment, are considered in this study (chapters 5 and 6). This section discusses the variables employed to capture these broad dimensions underlying the concept of each of the dimensions identified above. Due to the challenges in measuring the empowerment statuses of women directly, the measures discussed are proxies that are chosen systematically to represent the various dimensions and sub-dimensions of women's empowerment. The variables considered focused mainly on women's access to resources that can strengthen their ability to exercise their bargaining power (economic empowerment) and socially defined roles and norms that regulate their bargaining power and ability to make meaningful life choices (social empowerment). These proxies have been used in previous studies to measure the bargaining power of women (Allendorf, 2007; Hindin, 2000b, 2000a; Mullany, Hindin & Becker, 2005; Smith *et al.*, 2003).

Economic empowerment (access to resources)

The variables considered here focused mainly on women's access to resources to strengthen their ability to exercise their bargaining power. The variables include:

The employment status of women with options:

1. Not employed
2. Employed

Whether a woman owns land, with options

1. No
2. Yes

C. Whether a woman is has access to credit facilities

1. No
2. Yes

D. Whether a woman has savings

1. No
2. Yes

E. Husband did not trust a woman (his wife) with money

1. Agree
2. Disagree

Social empowerment

The selected variables in this dimension of empowerment include socially defined roles and norms that regulate their bargaining power and ability to make meaningful life choices or women's agency. Beyond the ability of these variables to show individual-level empowerment, they are deeply rooted in the society, such that societal judgement on whether they are acceptable or not may clout the effect on the wife or woman. The crucial nature of social institutions makes this dimension worthy of attention. Also, the apparent difficulty in changing social norms or accepted conventions, particularly when they systematically suppress one side of the population in a gendered system, reiterates the importance of the social dimension of empowerment. The variables used are as follows:

Participation in family decisions

The traditions, norms and values in society influence the decision-making power given to women in the household (Branisa, Klasen & Zeigler, 2009). Although the GSEPS does not ask as many questions as done in the DHS data, the questions asked cover all aspects of social empowerment. Respondents indicated their agreement or disagreement with some statements regarding household decision-making processes. The questions include:

The important decisions in the family should be made only by the men of the family, with responses being

1. Agree
2. Disagree

A wife has a right to express her opinion even when she disagrees with what her husband is saying, with responses being

1. Agree
2. Disagree

Regarding a woman's ability to express her opinions even when she disagrees with her husband, agreeableness to this statement indicates a position of power. In contrast, disagreement suggests the absence of a woman's ability to make decisions. Therefore, the variable is recoded so that higher values indicate increased empowerment (agreement takes the value 2, while disagreement takes the value 1). It is assumed herein that disagreement with the statement that the man (or husband) should be the sole decision-maker in the family suggests higher empowerment for women. In many typical traditional societies, traditions, beliefs and norms may enable men to be the powerful parties in the households. Such authority may be exploited to keep women in

disadvantaged positions, especially when decisions may not be favourable to women (Mabsout & van Staveren, 2010). To the extent that even women accept that it is ideal for men to be the sole decision-making parties in the household, it could mean that women are generally not empowered. In such instances, it is likely that men make a huge proportion of household decisions. When women participate in the decision-making process, they can directly influence what goes on within the household, which is more empowering. Also, a woman being able to express her opinion even she disagrees with her husband could signify the act of meaningful dialogue and an increased likelihood to arrive at a more optimal decision as opposed to a whole household being guided by unilaterally-made decisions by a partner.

It is worth noting that while the DHS offer more variables that probe into the makers of specific decision (own health, large household purchases, daily household purchases and visits to relatives), the question in the GSEPS asks of important decisions. Since the current study does not seek to probe into who makes which specific decision but is concerned about the extent of the woman's participation in important decisions, the author considers the two questions adequate for the analysis.

Women's attitude towards violent behaviour by their husbands

To examine the attitude of wives towards husbands' violent behaviour. Women indicated whether they agree or disagree with statements that justify violence and show that they approve of the act. Agreement with the statements directly suggests the lack of power to oppose harmful culture and social norms. Besides, agreement also shows the extent to which women have imbibed the traditions and norms that fuel the perpetuation of violence, leaving them helpless (Malhotra *et al*., 2002). The statements used are:

1. A wife should tolerate being beaten by her husband to keep the family together
2. If a wife refuses sex, it is correct for her man to beat her?

Autonomy of women

This aspect of social empowerment seeks to examine the various restrictions on the wife's freedom to spend money she has earned, move without the husband's knowledge or permit and maintain contact with her family. Suppose a woman agrees to any of the statements. In that case, it signifies the curtailment of her ability to either spend her earnings, benefit from the social support that emanates from keeping in touch with her family and that her freedom to move is restricted. The statements are:

1. When a wife has earned some money, she has the right to spend it on herself or her children without asking her husband
2. Name's partner insisted on knowing where (Name) was at all times
3. Name's partner frequently tried to limit (Name's) contact with (Name's) family

According to (Alkire & Chirkov, 2007; Alkire, 2005), women without autonomy often act in ways that do not reflect their own desires or interests.

Societal preferences

This dimension considers variables representing individual or family actions or beliefs that are preferred or upheld by society. Three societal preferences included in the study are

A. It is better to send a son to school than it is to send a daughter

1. Agree
2. Disagree

B. Couples' age differences (continuous)

C. Woman's age at marriage

The variable son preference (whether or not it is better to educate a son than a daughter), the difference in couple's age and age at marriage are issues held primarily by society than by individuals. Indeed, traditions, beliefs and norms of family systems affect which gender of a child is most preferred and the acceptable age differences between couples. Although it is illegal to give young girls out into marriage, some traditions and cultures permit this act. It continues unabated in some parts of Ghana (Immigration and Refugee Board of Canada Ghana, 2006; Jin, Li & Feldman, 2005; Skinner, 1997)

Aggregating variables to compute empowerment indexes

Some studies have computed indices for different dimensions of women's empowerment. Two ways of executing this have mainly been used. One way is the aggregation of variables into the sub-dimensions of women's empowerment such as autonomy, decision-making, attitude towards violence. The second way is to examine all the variables together using scree plots and correlations to assess the number of significant principal components that can be retained. In this subsection, all the variables are considered simultaneously to examine the underlying latent variables, which are supposed to account for the highest variations in the individual variables. Principal component analysis (PCA) is best suited to aid the extraction of the underlying latent variables (i.e., principal components) to give the maximum explanation of variations in the input variables themselves. Thus, the importance of each input variable to each principal component

extracted can be shown by the magnitude of the weights (factor loadings) attached. The PCA is a preferred data aggregation tool because it explains the variance-covariance structure of a set of variables using a linear combination of existing variables. In executing the PCA, all the 15 (See Table C1) variables mentioned above were analysed using scree plots to define the number of components that can be retained.

Table C 1 Description of input variables for principal component analysis

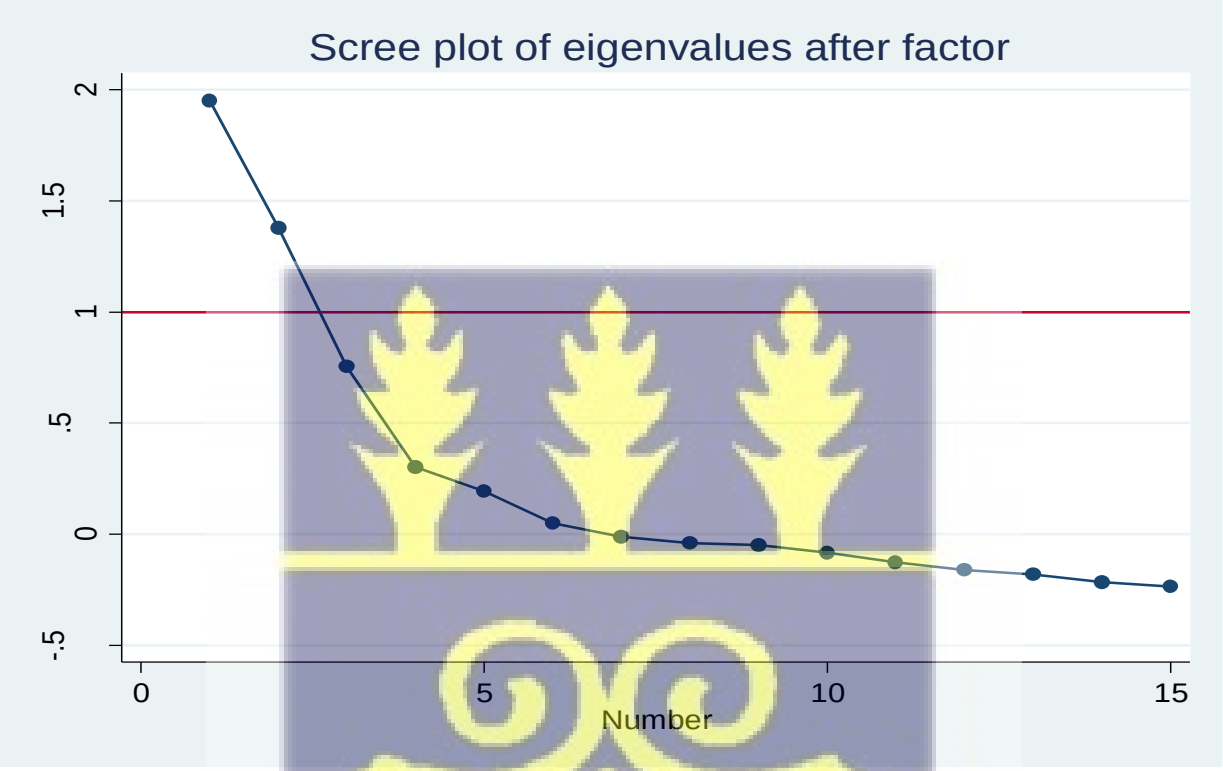
Variable	Code
A wife should tolerate being beaten by her husband in order to keep the family	1=Agree, 2=Disagree
Name's partner insisted on knowing where name was at all times	1=Agree, 2=Disagree
If a wife refuses sex, it is correct for her man to beat her	1=Agree, 2=Disagree
It is better to send a son to school than it is to send a daughter	1=Agree, 2=Disagree
The important decisions in the family should be made only by the man of the family	1=Agree, 2=Disagree
A wife has a right to express her opinion even when she disagrees with what h	1=Disagree, 2=Agree
Name's partner frequently tried to limit name's contact with name's family	1=Agree, 2=Disagree
When a wife has earned some money, she has the right to spend it on herself or her children without asking her husband	1=Disagree, 2=Agree
Woman is employed	1=Yes, 2=No
Woman owns at least a piece of land	1=Yes, 2=No
Woman can borrow money	1=Yes, 2=No
Woman has savings	1=Yes, 2=No
Couple's age difference	Continuous
Woman's age at marriage	Continuous
Name's partner did not trust name with money	1=Agree, 2=Disagree

Author's computation

Then orthogonal varimax rotation was applied to the retained components. The scree plots showed a sudden flattening of the curve (smaller reduction in the eigenvalues) after the third factor (see Figure C1). According to Cattell (1966), after plotting the eigenvalues, only components above the inflexion point should be retained. Thus, three factors should then be retained using the Cattell (1966) scree test. However, the third factor had an eigenvalue below 1.

According to Kaiser (1960) rule, only components with eigenvalues not less than 1 should be retained since the average eigenvalue is 1. Therefore, two components were retained, and a varimax rotation was executed.

Figure C1



The first two factors were then predicted and extracted from the analysis. The extracted components represent two domains of empowerment. The dominant input variables in the first domain are the woman's employment status, the land ownership status of a woman, access to credit, and whether the woman has savings. It was labelled "economic empowerment". The second domain included input variables relating to women's agreement or disagreement with some statements regarding beliefs and norms that determine women's agency. They include

tolerating beating to keep a woman's family, limiting a woman's contact with her family, son preference, decision-making participation, and whether a woman is always required to declare her location to her husband. It was labelled "social empowerment". The percentage of variance captured in each dimension and the factor loadings are shown in Table C2. Thus, the predicted indexes are normalised (rescaled to range between 0 and 1) to make for a more straightforward interpretation. Higher values (closer to 1) indicate a higher position on the particular dimension vis-à-vis lower values (closer to 0).

Table C2 Factor loadings from principal component analysis

	Factor loadings			
	Unrotated		Varimax rotation	
Variable	Economic empowerment	Social empowerment	Economic empowerment	Social empowerment
A wife should tolerate being beaten by her husband in order to keep the family	**0.5574**	0.0118	**0.5590**	0.1189
Name's partner insisted on knowing where name was at all times	**0.4773**	-0.1968	**0.5095**	-0.0836
Name's partner frequently tried to limit name's contact with name's family	**0.5597**	-0.1435	**0.5777**	-0.0129
It is better to send a son to school than it is to send a daughter	**0.4213**	0.0600	**0.4968**	0.1539
The important decisions in the family should be made only by the man of the family	**0.6386**	0.1263	**0.6473**	0.2105
A wife has a right to express her opinion even when she disagrees with husband	0.0389	-0.2068	0.0089	-0.2103
If a wife refuses sex, it is correct for her man to beat her	0.1682	-0.2001	0.2058	-0.1000
When a wife has earned some money, she has the right to spend it on herself or her children without asking her husband	0.0753	0.0872	-0.0931	0.0679
Employment status of woman	0.1999	**0.5289**	0.0268	**0.5234**
Woman owns at least a piece of land	0.0948	**0.5541**	0.0348	**0.4689**
Woman can borrow money	0.1247	**0.4126**	0.0280	**0.4302**
Woman has savings	0.2610	**0.6435**	0.1764	**0.6937**
Couple's age difference	0.1547	0.0099	0.1148	0.0907
Woman's age at marriage	0.1060	0.0279	0.2091	-0.1568
Name's partner did not trust name with money	0.0835	0.1891	0.1503	0.2304
Kaiser-Meyer-Olkin measure of sampling adequacy		0.7963		

Author's computation

APPENDIX D Endogeneity tests

Table D1 Tests for endogeneity of measures of women's empowerment

Variable	Height-for-age	Weight-for-height	Digit-span	Math	English language
Economic empowerment					
Endogeneity test Statistic	39.65	49.16	1.24	2.44	0.945
Endogeneity – P-value	[0.000]	[0.000]	[0.221]	[0.118]	[0.778]
First stage F Statistic	176.23	133.18	115.36	119.55	131.16
Social empowerment					
Endogeneity test Statistic	77.33	62.84	2.07	1.42	2.64
Endogeneity stat P-value	[0.000]	[0.000]	[0.154]	[0.271]	[0.191]
First stage F Statistic	84.45	131.76	182.46	177.88	165.41

Note: P values are in []. Endogeneity statistics are the Durbin-Wu-Watson statistics

Author's computation

Table D2 Tests for endogeneity for GDP growth and the Women's Political Empowerment index

Variable	Household Income	HD
GDP growth rate		
Durbin test Statistic	21.22	11.73
P-value	[0.000]	[0.000]
Wu-Hausman test Statistic	19.97	11.01
P-value	[0.000]	[0.000]
Political empowerment of women		
Durbin test Statistic	16.64	22.56
P-value	[0.000]	[0.000]
Wu-Hausman test Statistic	16.31	21.43
P-value	[0.000]	[0.000]

Note: P values are in [].

Author's computation

APPENDIX E VARIABLE DESCRIPTION

Table E1 Variable definition and sources

Variable	Description and source
HD	The non-income measure of welfare. Source: Author's computation
Household Income	Per capita household income expressed in 2011 PPP-adjusted USD. Source: World Bank PovcalNet database
Women's Political Empowerment	Women's Political Empowerment Index. Scale is from 0 to 1, higher score indicating greater empowerment. Source: VDEM (Coppedge *et al*., 2018)
Economic growth	Predicted values of the growth rate of GDP using an augmented production function
Income Inequality	Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. Scale is from 0 to 100, where 0 represents perfect equality and 100 implies perfect inequality. Source: WIID
Political instability	Number of successful coup d'états. Source: Centre for Systemic Peace (CSP)
Government spending	Total government expenditure on health and education as a percentage of GDP. Source: WDI
Age dependency ratio	The age dependency ratio is measured as the ratio of the non-working population (children below age 15 and the aged (above 64)) to the working-age population (age 16 to 64). Source: WDI
Urbanization	The percentage of people living in urban areas (as defined by national statistical offices). It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. Source: WDI
Access to improved water	Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection). Source: WDI
Access to improved sanitation	Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to piped sewer system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet. Source: WDI
Quality of governance	The mean value of the ICRG variables "Corruption", "Law and Order" and "Bureaucracy Quality", scaled 0-1. Higher values indicate higher quality of government. Source: ICRG database
Democracy index	Scale ranges from 0-10 where 0 is least democratic and 10 most democratic. Source: Freedom House/Polity
Openness	Sum of exports and imports of goods and services (% GDP). Source: WDI.
Inflation	Inflation rate. Source: WDI.

Author's computation