TOPICS ON GENDER AND CHILD DEVELOPMENT OUTCOMES

by

Junior Abdul-Wahab

A Dissertation

Submitted to

KDI School of Public Policy and Management

in partial fulfillment of the requirements

for the Degree of

DOCTOR OF PHILOSOPHY

IN DEVELOPMENT POLICY

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ABSTRACT

by

Junior Abdul-Wahab

This dissertation covers contemporary topics on gender and child development outcomes in developing countries. The first chapter, *Women's status in developing countries: a new measure and children's development outcomes*, highlights the limitations of traditional measures of women's status and makes a case for a multidimensional approach that is context and concept relevant. The proposed measure draws mainly from conceptual works by Bina Agarwal (1997) and Naila Kabeer (1999). The composite index of women's status and its independent dimensions are estimated using data from the *Ghana Socioeconomic Panel Survey* I and II. The empirical analysis reveals that the indices are associated with traditional measures of women's status with the expected sign and are also good predictors of child health and cognitive outcomes. Further analysis reveals that independent dimensions affect child development outcomes differently. The findings of this study contribute to the ongoing search for a comprehensive measure of women's status and provide new insights into how the subject should be approached, especially in developing countries.

The second chapter is titled *Do cash and in-kind food transfers have the same effect on children's welfare? Identifying mechanisms using a cluster Randomized Control Trial in Northern Uganda*. The chapter presents a theoretical framework demonstrating how social assistance programs may generate different welfare outcomes for children. The model predicts that efforts to increase

children's welfare will be more effective if they shift the balance of power in the household in favor of the mother. This prediction is validated using data from an RCT in northern Uganda to assess the relative effectiveness of cash and food transfers in improving children's nutritional outcomes. The empirical findings show that cash transfer to the mother is more effective at improving children's welfare outcomes than in-kind food transfers of equivalent value. The study highlights the role of preference differences, social norms, and bargaining power in determining the success of child-focused interventions.

The third chapter, *Elected Local Female Leaders and Gender Stereotypes***,** examines the effects of exposure to competitively elected local female politicians in Ghana on women's perception of themselves (self-efficacy) and men's perceptions of women (gender stereotypes). The chapter uses data from the 2010 district assembly elections in Ghana and the *Ghana Socioeconomic Panel Survey* I and II. Using a difference-in-differences with propensity score matching (PSM), we find that exposure to elected female leaders over one election cycle increases women's self-efficacy but has no effect on gender stereotypes. The finding suggests that while there is an opportunity to promote female participation in leadership to increase women's self-efficacy, complementary programs may be necessary to improve gender stereotypes.

Keywords: women's status, intrahousehold decision-making, child health, child nutrition, child development, transfer modality, food transfer, cash transfer, female leader, women's political participation, gender stereotypes.

Dedicated to BARAKTU MOHAMMED

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LIST OF ABBREVIATIONS

Abbreviation	Definition
ATE	Average Treatment Effect
CODEO	Coalition of Domestic Election Observers
DACF	District Assemblies Common Fund
DID	Difference-in-differences
EA	Electoral Area
ECD	Early Childhood Development
EEPs	Extra-Environmental Parameters
EFA	Exploratory Factor Analysis
EGC	Economic Growth Center
FA	Factor Analysis
FAO	Food and Agriculture Organization
FE	Fixed Effect Estimator
GDI	Gender Development Index
GEI	Gender Equality Index
GEM	Gender Empowerment Measure
GGGI	Global Gender Gap Index
GPRL	Global Poverty Research Lab
GRA	Ghana Revenue Authority
GSPS	Ghana Socioeconomic Panel Survey
HAZ	Height-for-age z-score
HDI	Human Development Index
IFRPI	International Food Policy Research Institute
IPV	Intimate Partner Violence
ISSER	Institute of Statistical, Social, and Economic Research
ITT	Intent To Treat
IV	Instrumental Variable
KMO	Kaiser–Meyer–Olkin
LATE	Local Average Treatment Effect
MMDAs	Metropolitan, Municipal, or District Assemblies
MP	Member of Parliament
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PSM	Propensity Score Matching
RCC	Regional Coordinating Council
RE	Random Effect Estimator
SD	Standard Deviation
SDG	Sustainable Development Goal
SIGI	Social Institutions and Gender Index
UN	United Nations
UNDP	United Nations Development Programme

UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WAZ	Weight-for-age z-score
WEIA	Women's Empowerment in Agriculture Index
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight-for-height z-score

1 WOMEN'S STATUS - A NEW MEASURE - AND CHILD DEVELOPMENT OUTCOMES

by

Junior Abdul-Wahab

ABSTRACT

This chapter examines the relationship between a mother's status in the household and her child(ren)'s health and cognitive outcomes. The measure of women's status, and its independent dimensions, are constructed using multiple indicators of self-efficacy, decision-making, mobility, and IPV. Child health outcomes are measured using the incidence of illness, stunting, underweight, and wasting. Child cognitive outcomes are measured using tests assessing reading and comprehension, arithmetic, memory capacity, and pattern recognition.

The empirical findings indicate that the mother's relative status in the household is a significant determinant of her child's health and cognitive outcomes. Furthermore, the mother's mobility rights and incidence or threats of IPV are more important for her child's health. In contrast, the mother's self-efficacy and decision-making attributes are more significant for the child's overall cognitive development.

This study contributes to the ongoing search for a holistic measure of women's status by proposing a multi-dimensional and context-relevant measure. The finding that separate dimensions of the mother's status influence child development differently opens up new possibilities and offers new insights into designing and evaluating child-focused programs.

1.1 Introduction

Improving women's status is widely acknowledged in academic and policy circles as a means to achieve multiple interconnected outcomes for women and their children. Women's status is closely linked to their participation in household decision-making (Beegle et al., 2001; Behrman, 2017; Oduro et al., 2012), protection from domestic abuse (Koenig et al., 2003; Panda & Agarwal, 2005), and better wellbeing outcomes for their children (Hoddinott & Haddad, 1995; Smith et al., 2003). Improving women's status is also advocated to create a just and equitable society where men and women coexist as equals. For this and other reasons, the international development community and policy actors now routinely view women's status as a fundamental policy objective. For instance, empowering women and girls is an explicit goal of the United Nation's Sustainable Development Goals (SDGs) and a key component in achieving the other SDGs (UNwomen, 2018). Also, gender mainstreaming – integrating gender perspectives into policy design, implementation, and evaluation – is increasingly being used and advocated by development actors to combat gender inequality.

Despite these efforts, the lack of appropriate and comprehensive indicators to measure women's status makes it difficult to evaluate the effectiveness of policies and programs designed to improve them. The most commonly used proxies of women's status in the literature – such as income, assets, and employment status – are "static" and one-dimensional and often fail to capture the essence and multidimensional nature of women's status (see Alkire, 2008; Kabeer, 2005, 1999). A good measure of women's status should also consider the influence of gender norms and the broad sociocultural environment, which are crucial in defining women's role in the household in most societies (Agarwal 1999). In societies where gender norms are salient, traditional indicators may not adequately reflect the inequalities women face.

This study proposes a multidimensional measure of women's status that is context and concept relevant. We develop the indices from survey responses covering power dynamics in the household. We extract dimensions of women's status using a multivariate technique and then combine them into a single composite index. We then validate the composite index and its independent dimensions by examining their relationship with other proxy measures of women's status used in the literature. The findings indicate that the indices correlate with commonly used proxy measures of women's status. Also, the separate dimensions did not always correlate with the proxy measures in the same way.

The second part of the study examines the relationship between the composite index of a mother's status and its separate dimensions on child development outcomes. While one of the main contributions of this study is to create an index that is context and concept relevant, examining the relationship with children's welfare outcomes makes it more appealing and acceptable to policymakers (Kabeer, 1999). The findings show that the composite index of the mother's status is positively associated with better child health and cognitive outcomes. Also, the independent dimensions affect child development outcomes differently. The mother's *outcome* attributes (mobility rights and freedom from violence) are more relevant to the child's health outcomes. In contrast, her *self-efficacy* attributes (power within and decision-making) are more relevant to the child's cognitive outcomes.

The study contributes to the literature by highlighting the differential effects of dimensions of the mother's status on child development outcomes, which could inform how policies or interventions are curated and their effectiveness assessed. Also, the findings are one of the few to establish an empirical relationship between a mother's relative status in the household and her child's cognitive outcome.

The rest of the chapter is as follows; section 1.2 presents a brief literature review on measures of women's status. Section 1.3 presents the data source, variable description, and summary statistics. Section 1.4 discusses constructing the composite index of women's status. Section 1.5 presents the empirical model and estimation strategy. Section 1.6 presents the estimation results. Section 1.7 summarizes and concludes.

1.2 Measuring Women's status in the literature

Attempts to measure women's status, especially in the intra-household literature, have mainly focused on women's access to and ownership of economic resources. The justification for this is that a more equitable distribution of resources in the household improves the woman's agency and influence such that household decisions reflect more of her preferences. A large body of theoretical and empirical evidence supports this line of argument. For instance, the main feature of the collective household model is that the preferences of each household member and their control of resources are vital in determining the intrahousehold allocation of resources. Furthermore, evidence from the empirical literature finds that women's relative income (Hoddinott & Haddad, 1995; Thomas, 1993) and asset ownership (Quisumbing & de la Briere, 2000) affects household expenditure patterns in a way that reflects women's preferences. Beegle et al. (2001), Behrman (2017), and Oduro et al. (2012) also find a direct relationship between women's asset ownership and participation in household decision-making.

The fact that economic resources are determinants of women's status and are also simultaneously impacted by it presents one of the biggest challenges with utilizing them as proxies in empirical analyses. While ownership or control of economic resources improves the relative standing of women in the household, women with high status may have more say regarding their ability to work for pay or purchase and keep assets. This bi-directional relationship makes it challenging to identify the causal effect of women's status on some outcome variables in policy evaluations. Other indicators such as non-labor income (Thomas, 1990; Thomas, 1993; Schultz, 1990), inherited assets (Quisumbing & de la Briere, 2000; Strauss & Thomas, 1995), and assets before marriage (Quisumbing & Maluccio, 2003) are often used as more exogenous alternatives.

Measures of economic resources cover a narrow dimension of women's status, which may or may not translate into higher status or better outcomes for women. They represent potential rather than an actual realization of women's agency (Kabeer, 1999). The extent to which economic resources translate into an improvement in women's agency depends on the social and institutional structures that govern their ownership and use. In societies where women's participation in economic activities and ownership of financial resources are limited, such indicators may not truly reflect the relative status of women in households. The rationale for using employment status to proxy women's status is that it is associated with some form of earnings, increasing women's outside options. However, only 13.2% of employed females in low-income countries received some form of wages and salary (World Bank, 2022). Not to mention that the burden of domestic work falls disproportionately on women even when employed (Chimes, 2019). Also, women with higher status may opt-out of employment when wages are low, as they are more likely to have higher reservation wages.

Similarly, several studies have documented substantial gender gaps in asset ownership in developing countries, often attributed to discriminatory gender norms (Kilic & Moylan, 2016; Doss, 2014). In most societies, particularly in developing countries, inheritance laws and norms discriminate against women despite inheritance being the primary channel for asset ownership (Gaddis et al., 2020; Peterman, 2012). Even when women own assets, their control over them may be limited, affecting their ability to use them in a way that improves their agency or status.

Most importantly, the status of women is conceptually a multidimensional and latent construct (Alkire, 2008). It cannot be easily observed or adequately captured by a single variable. Recent efforts at measuring women's status have focused more on constructing a composite index of women's status using multiple indicators. Earlier initiatives, such as the United Nations

Development Program's (UNDP) Gender Development Index (GDI) and Gender Empowerment Measure (GEM), sought to assess the relative status of women across countries using country-level indices of gender equality. Several other composite indicators have since been developed to evaluate gender equality across countries. Some of these indicators are the Social Institutions and Gender Index (SIGI) by the Organization for Economic Co-operation and Development (OECD), the World Economic Forum's Global Gender Gap (GGG) measure, and the Gender Equality Index (GEI) by Social Watch. Most macro-level indicators focus on the formal economy and disregard local institutional variables that play a critical role in defining women's status (Bardhan & Klasen, 1999). Only SIGI acknowledges social institutions as the underlying driver of gender inequality. SIGI focuses on four main dimensions: family discrimination, access to productive and financial resources, civil liberties, and physical integrity (OECD, 2019a). Furthermore, these indices are uninformative about within-country variations in women's status and how that contributes to effective policy-making.

The availability of gender-disaggregated data in household surveys has enabled researchers to replicate this approach at the household level. The Women's Empowerment in Agriculture Index (WEIA), developed by the US Agency for International Development (USAID), the International Food Policy Research Institute (IFRPI), and the Oxford Poverty and Human Development Initiative, assesses women's participation in agriculture. The index measures the degree of women's involvement in five main domains: decisions about agricultural production, use of productive resources, control over income, leadership in the community, and time use. Other studies assess women's relative status using indicators across multiple spheres of influence within the household. These usually involve women's responses to survey questions regarding their participation in different decision domains (e.g., expenditure, health, education), ability to make

strategic life choices (e.g., self-efficacy, control over own resources, and ability to work), or welfare outcomes (e.g., freedom of movement, freedom from violence). A guiding principle for selecting which indicators to include is that they should be relevant to the context and consequential for women's status. Also, the index should capture the influence of social norms or institutions, given its overarching role in intrahousehold relations (Agarwal, 1997; Chang et al., 2020; Kabeer, 1999). Social norms define the role of individuals, constrain behavior, and shape preferences and interests. Women's ability to express their agency beyond limitations imposed by social norms is an essential expression of women's status.

In this study, a multidimensional index of women's status is created based on the conceptual definitions proposed by Kabeer (1999), Laszlo et al. (2020), and Chang et al. (2020). The index encompasses indicators for decision-making, self-efficacy, autonomy, freedom from abuse, and attitudes and perceptions of gender norms. Due to potential endogeneity and other constraints noted above, the index avoids direct measures of economic resources. An appealing feature of the index is that it brings together most of the indicators of women's status widely accepted in the literature but rarely captured due to data limitations. It also captures the overarching role of social norms and perceptions, making it more relevant in contexts where social norms are more salient in defining intra-household relations.

1.3 Data and Variable description

The data for this study is from the first two waves of the Ghana Socioeconomic Panel Survey (GSPS), a joint effort by the Economic Growth Center (EGC) at Yale University and the Institute of Statistical, Social, and Economic Research (ISSER) at the University of Ghana. The GSPS provides a regionally representative dataset covering all regions in Ghana. The survey tries to follow the same individuals over time, even if they leave the household or the study area, which alleviates attrition concerns that are usually common in panel datasets. The baseline survey in 2009/2010 collected detailed socioeconomic information from 18,889 household members in 5,009 households. The second wave successfully interviewed 16,356 individuals from 4,774 households.

This study uses data from the demographic, household health, children's, power, and asset modules of the GSPS. Unless otherwise stated, children refer to individuals 15 years and younger. Women's status in this study's context refers to the mother's status in the household. The two terms are used interchangeably in the rest of the paper.

1.3.1 Women's Status

Data from the survey's module on power dynamics in the household is used to construct the index of women's status. The module contains information on social norms governing gender relations and direct indicators of women's agency, trust, freedom of movement, and freedom from abuse. As argued by scholars such as Chang et al. (2020), Kabeer (1999), and Laszlo et al. (2020), a comprehensive measure of women's relative status should cover critical domains such as decision-making, autonomy, freedom from abuse, and external constraint to access and use of resources.

These domains are adequately covered in the survey's module on power dynamics in the household. Section 1.4 details the specific indicators and the construction of the composite index.

Women are the primary caregivers of children in most cultures around the world, and as such, their well-being is linked to that of their children. Children at a young age are almost entirely reliant on their mothers for sustenance. Also, evidence from the intrahousehold literature indicates that mothers are more likely to allocate resources towards expenditure that benefits children when they influence household decisions. Furthermore, access to social networks enables a mother to learn about best childcare practices, allowing her to challenge cultural practices that may harm her child. In addition, if a mother controls her time, she can act quickly in emergencies to help save her child.

1.3.2 Child health outcomes

Children's health outcomes are measured using self-reported illness and anthropometric information from the GSPS. Short-term health is measured using illness in the last two weeks before the survey. Long-term health and nutritional outcomes are measured using height-for-age z-score (*HAZ*), weight-for-age z-score (*WAZ*), weight-for-height z-score (*WHZ*), stunting, underweight, and wasting estimates.

HAZ, *WAZ*, and *WHZ* are estimated using anthropometric data in line with the 2007 World Health Organization (WHO) Child Growth Standards (WHO, 2009). Height-for-age (weight-for-age) z-scores measure the number of standard deviations the height (weight) of a child is from the median of children their gender and age in an international reference population. *WHZ* is the number of standard deviations of a child's weight, given their height, from the median of the reference population. Stunting, underweight, and wasting are computed from *HAZ*, *WAZ*, and

WHZ, respectively. A child is considered stunted, underweight, or wasted if their *z-score* is below -2 standard deviations (SD). Stunting (underweight) measures the failure to achieve the required height (weight) compared to well-nourished children in a reference population. Wasting indicates low weight given a child's height compared to a well-nourished child.

According to WHO (2022), stunting may reflect the cumulative effect of malnutrition and infections before and after birth. Underweight indicates severe weight loss and may reflect stunting, wasting, or both. Wasting is a measure of thinness and often means recent and acute weight loss. The incidence of either three is associated with higher mortality risks in children, and in the case of stunting, it may lead to poor mental development. All three indicators are listed in WHO's global reference list of 100 core health indicators (WHO, 2018). They are also the primary indicators for tracking progress toward achieving the global nutrition targets for 2025 (WHO, UNICEF, 2017).

A health index for each child is computed by aggregating and standardizing the incidence of illness, stunting, underweight, and wasting. The health index, therefore, represents multiple incidences of nutritional or health deficiency in a child. A higher score for the index means worse health outcomes.

1.3.3 Child cognitive outcomes

Child cognitive outcomes are measured using five tests administered as part of the GSPS to assess four broad domains of cognition – namely language comprehension, arithmetic, memory, and pattern recognition. The tests are as follows:

***English test*:** The English test assesses reading and comprehension ability. The test comprises a short passage, and each eligible child reads and answers a set of multiple-choice questions based

on it. Because the test requires some basic reading skills, it is only offered to children nine years and above who attend school.

Math test: The Math test assesses the child's ability to do basic arithmetic. Each eligible child is presented with multiple-choice questions to select the correct answer. The Math tests also require some basic reading skills and are only given to children nine years and above who attend school.

The digit span tests: The digits span tests measure an individual's short-term memory number storage capacity. They are one of the most extensively used short-term memory tests and are a component of the widely used Weschler memory scales and Wechsler IQ scales (Woods et al., 2011). The tests do not require reading skills, so all children in the household aged five years and above are eligible irrespective of school attendance. The tests are as follows: A sequence of numbers is read to a child at one-second intervals. The child repeats the numbers as heard (digits forward) or in reverse order (digits backward). The initial sequence is short and gets longer if the child answers correctly. The test terminates after three incorrect responses, and the number of correct responses is the child's score for each span test.

Raven's Progressive Matrix (RPM): Raven's test evaluates abstract reasoning and is widely regarded as a non-verbal assessment of fluid intelligence (Bilker et al., 2012). It enables the evaluation of cognitive ability without regard for language or reading skills. The test is administered to all children in the household above the age of five, regardless of school attendance. The test consists of a series of visual diagrams with a missing piece. The child selects the component that best completes the pattern. Initial questions are simple and get more challenging as the test progresses.

All test scores are standardized by age to remove the effect age might have on them and to make them comparable. Factor analysis is used to construct a ***cognitive index*** for each child using the age-standardized test scores.

1.4 Constructing the Index of Women's Status

1.4.1 Introduction

Composite indicators are commonly used when a single variable or indicator cannot adequately capture a particular concept to be measured. They enable complex and multidimensional concepts to be presented in a simple form to support decision-making. Most metrics in economics, finance, and other social science fields are represented using composite indicators. For instance, the Human Development Index (HDI), a universally accepted measure to assess the development of a country, is a composite index of life expectancy, education, and per capita income. The SIGI, GGG, and GEI are examples of country-level measures of gender inequality that are composite indicators. Composite Indicators have experienced dramatic growth in usage in recent years owing to improved literacy, the intricacies of contemporary issues, and advances in information technology (Stiglitz, Sen & Fitoussi, 2009).

The justification for using a composite indicator to measure women's status in the household is that it is a complex, multidimensional, and latent construct that is not readily observable or measurable. The assumption here is that it can be inferred from its effect on certain outcomes for women, such as self-efficacy, freedom of movement, perceptions of gender roles, and incidence and acceptance of domestic violence, among others. We first present a conceptual framework that informs the selection of the indicators and the variables to measure them. We then employ an Exploratory Factor Analysis (EFA) method to extract the latent dimensions form the variables.

The rest of the section details the procedure for constructing the index following guidelines outlined in Barbieri et al. (2017) and the *Handbook On Constructing Composite Indicators* by the OECD and the Joint Research Centre (JRC) of the European Commission (OECD & JRC, 2008).

Although the guidelines are primarily for creating composite country-level indicators, this study attempts to adopt this method for the household. The subsections below outline the steps.

1.4.2 Theoretical framework

The concept of women's status is operationalized in different strands of the literature as decision-making power, bargaining power, or agency, among others. The theoretical underpinnings of unequal power distribution within the household and its effect on individual well-being are closely linked to developments in the theory of household behavior, notably the collective household models. Researchers advanced the collective models to challenge the unitary model's characterization of the household as a single decision-making unit. The collective models recognize that multi-member households comprise individuals with different preferences among whom a collective decision process takes place. The cooperative household models by Manser and Brown (1980), McElroy and Horney (1981), and McElroy (1990) model the household decision process using a bargaining approach. Household members maximize the benefits of household membership by using their bargaining power to reach Pareto-efficient outcomes. Each household member's bargaining position, thus their ability to influence household decisions, is determined by how well they will do outside the household, which McElroy (1990) termed extrahousehold environmental parameters (EEPs). EEPs may include but are not limited to control of resources outside the household, social networks, divorce laws, and social norms. The collective model proposed by Chiappori (1988, 1992) does not explicitly model the household decision process but assumes household decisions are Pareto efficient. Browning and Chiappori (1998) show that under some weak assumptions, the model proposed by Chippori (1988, 1992) leads to household preferences that depend on wages, prices, and individual non-labor income. The presence of non-labor income indicates that individual resources influence household allocations. Bourguignon,

Browning, and Chiappori (1994) allude that changes in distribution factors, similar to the EEP terminology by McElroy (1990), may influence the bargaining positions of household members. Thus, the literature on household behavior recognizes that the ability of household members (including women) to influence decisions depends on control over resources, social networks, the sociocultural environment, and institutional structures.

Kabeer's (1999) framework of women's empowerment presents a more gendered approach to conceptualizing and measuring women's status. According to Kabeer (1999), empowerment is the ability to make strategic life choices in situations one previously could not. One's ability to exercise choice depends on three interrelated dimensions: resources (pre-conditions), agency (process), and achievements (outcomes). Resources are allocations or future claims to economic, human, and social resources. Resources are essential enablers of choice but do not constitute realized choice or power. Traditional measures of resources, such as education, employment, income, assets, and social networks, are only considered empowering if they enhance one's ability to exercise choice. The utility or relevance of different types of resources to exercising choice may vary considerably in different contexts. Ultimately, the choice of indicators for resources to measure empowerment is context-specific and is determined by the institutional and cultural structures within which one finds themselves.

Agency is the second dimension in Kabeer's framework, which refers to the ability to define and pursue own goals. Women's agency encompasses observable actions, such as decision-making roles, mobility rights, and partner violence, and the unobservable, such as a sense of self-worth or 'the power within,' aspirations, and reflection. In the literature, measures of women's agency have mainly focused on observable actions because they are easily measured and readily available in surveys. Unobservable measures such as perceptions and self-efficacy are as relevant to women's

ability to influence decisions as the observables. Researchers frequently regard such indicators as less relevant because they are difficult to measure, which is very misleading (Agarwal, 1997). Generally, indicators considered a good measure of a woman's agency should be relevant to her ability to make strategic life choices. For instance, the household comprises several decision-making spheres, from the mundane such as decisions regarding the type of meal to prepare to the most consequential, such as those relating to the woman's reproductive health or her decision to work. Decision-making in domains women have traditionally been responsible for may not be as consequential for women's agency as in traditionally male-dominated domains. Also, decision-making metrics only provide a glimpse of the intricate negotiations that occur within the household and may not capture informal negotiations within the household. A woman's mobility rights are crucial to accumulating and accessing resources outside the household. As with other indicators, a good mobility measure should be consequential to a woman's agency. For instance, while movement to markets might be significant for women's overall well-being, these are locations where women's access in most societies is generally unrestricted. Intimate partner violence (IPV) is widely regarded as an assertion of patriarchal power that impedes women's ability to exercise agency. Ultimately, what counts as a good indicator of a woman's agency depends on the local context and its potential to enhance a woman's capacity to influence decisions and make strategic life choices.

Achievement is the third dimension in Kabeer's framework, defined as gender differences in well-being outcomes due to inequalities in the capacity for choice. Gender differences in nutrition, shelter, and health outcomes are generally accepted indicators for achievements due to their consequence for human survival. What matters for empowerment is identifying whether the observed difference in outcome is due to preference or lack of choice. Gender differences in

welfare outcomes are commonly used as macro-level measures of gender inequalities. The GDI, for example, looks at gender differences in life expectancy, adult literacy, school enrolment, and income. The GEM also uses the proportion of seats held by women in national parliaments, the proportion of women in decision-making positions, and the female share of earned income.

This study measures a woman's relative status in the household, which is analogous to the agency dimension in Kabeer's framework or bargaining power in the intrahousehold framework. We follow a recent review by Laszlo et al. (2020) and Chang et al. (2020) to categorize the indicators of women's agency into four domains. The categorizations are defined below.

- Power-within: This category covers the intangible aspect of a woman's agency. It relates to a woman's belief in her ability to set goals and act on them. The attributes captured under this category are self-worth, attitudes toward gender norms, and aspirations. These attributes are subjective and usually depend on a woman's perceptions, social norms, and cultural institutions.
- Decision-making: This category gives an insight into the intricate negotiations that take place within the household. The indicators under this category are measured by asking women about their participation in several decision-making spheres in the household. To be considered a valid measure, the decision domain should be consequential to the woman's ability to make strategic choices and not conform to existing gender roles.
- Mobility rights: A woman's ability to decide where and when to go out is a fundamental element of her agency or status. When women's movements are constrained, they cannot effectively participate in economic, political, and social activities. For young girls, this may limit their ability to participate in schooling or form social networks outside the household.

- Freedom from violence: This indicator includes both incidence and women's acceptance of Intimate Partner Violence (IPV). IPV may take several forms, such as physical, verbal, emotional, or sexual. The incidence of IPV or the threat of it can severely impede one's ability to express agency; in extreme cases, it could lead to death. In relationships where partners share power equally, the frequency of IPV is minimal, and conflicts are resolved in a non-violent way (Kurz, 1993). Acceptance of IPV by women may also signify an internalized position of lower self-worth (Kabeer, 1999). This indicator is measured by asking women or girls how frequently they experience the different types of abuse or their perceptions about it. Since this is a sensitive topic, there are guidelines for collecting this information in household surveys.

The first two categories, power-within and decision-making, are the 'unobservable' components of women's agency. The latter two are the 'observable' since they are relatively easier to observe and measure.

1.4.3 Data selection

The conceptual framework should inform data selection, and the choice of variables must also be relevant to the evaluated context. Composite indices are notoriously data-intensive, especially those measuring gender inequalities, due to the different dimensions that need to be adequately captured. The SIGI, for instance, consists of 4 dimensions, 16 indicators, and 27 variables. The GEI consists of six domains, 14 sub-domains, and 31 indicators.

The four main domains of women's status identified in the theoretical framework are measured using information from the Ghana Socio-economic Panel Surveys (GSPS). The survey has a dedicated module designed to examine intrahousehold power dynamics, making it ideal for this

study. The table below lists the variables from the module and the domains they are most likely to capture.

Table 1.1. Women's status domains and measures

Domains	Variables
Power-within	• A wife has a right to express her opinion when she disagrees with what her husband is saying • A wife should tolerate being beaten by her husband. • It is better to send a son rather than a daughter to school • Your partner does not trust you with money. • If a wife refuses sex, her man can beat her. • If a wife refuses sex, her man can withhold money from her.
Decision-making	• Important decisions in the family should be made only by men. • A wife can refuse to have sex with her husband. • When a wife earns money, she has the right to spend it on herself or her children without asking her husband.
Freedom of movement	• Your partner frequently tried to limit your contact with your family. • Your partner insists on knowing where you are at all times.
Freedom from violence	• Your partner accuses you of being unfaithful. • How often does your partner insults you? • How often does your partner threaten to hurt you? • How often did your partner push, hit, slap, or throw something at you? • How often did your partner kick, drag, or beat you up?

1.4.4 Imputation of missing data

Missing values may hamper the construction of consistent indicators. A listwise deletion may be considered if the proportion of missing variables is small. Listwise deletion produces unbiased estimates for data missing completely at random but may reduce the effective sample size. Listwise

deletion, however, creates bias if data is not missing at random, and the bias increases proportionate to the missing data. (Little & Rubin, 2002). A single imputation technique, such as mean imputation and regression imputation, may be considered if missing variables are less than 10 and 15 %, respectively (Wakins, 2018). Multiple imputation techniques are considered more appropriate for large amounts of missing values.

Three types of missing data relating to age ineligibility, non-response, and attrition are anticipated due to the panel structure of the dataset. By design, the information on power dynamics in the household is not available for girls younger than 15 years. Non-response and attrition could be potential sources of bias if they are systematic or correlated with any of the indicators of women's status. The percentage of missing data in the original variables that is not age-related is between 3.28% and 4.98%.

Two alternative approaches are adopted to keep the missing values in the final index below the threshold. The first approach replaces missing observations for each individual using the average of the non-missing values before index construction. Alternatively, a regression imputation technique is used to input the missing values in the final index after constructing the index without replacing missing values. The method uses the predicted value from a regression of the composite index on correlates of women's status to replace all cases of missing data.

1.4.5 Normalization

Normalization is required before data aggregation to ensure all variables are measured on the same scale. It also guarantees that no single variable has an undue influence on the final index.

Most of the variables used in constructing the index are binary, while the remaining are ordinal. The ordinal variables are first normalized using the min-max normalization method. The minimum of each variable converts to 0, its highest value to 1, and all remaining values to decimals between

0 and 1. Finally, all responses are re-coded so that positive outcomes are one and negative outcomes are zero. Table 1.2 below shows the summary statistics of the normalized variables.

Table 1.2. Summary statistics of variables for the composite index of women's status

	Wave 1			Wave 2		
Variables	N	Mean	SD	N	Mean	SD
Important decisions should be made by men only (1 = No)	2800	0.61	0.49	2606	0.56	0.50
Wife should tolerate beating (1= No)	2800	0.69	0.46	2605	0.70	0.46
Husband can hold money if wife refuses sex (1 = No)	2706	0.9	0.30	2603	0.85	0.35
Husband can insult his wife if she refuses sex (1= No)	2774	0.93	0.26	2607	0.92	0.27
Husband limits contact with family (1 = No)	2250	0.96	0.19	2252	0.94	0.24
Know where at all times (1 = No)	2248	0.58	0.49	2252	0.59	0.49
It is better to send a son to a school than a daughter (1 = No)	2793	0.84	0.36	2608	0.92	0.27
Accused of infidelity (1 = No)	2252	0.96	0.20	2248	0.92	0.27
Not trust with money (1 = No)	2240	0.93	0.25	2249	0.8	0.40
Wife can express her opinion if she disagrees (1 = Yes)	2799	0.85	0.35	2609	0.88	0.32
Wife can spend her own money (1 = Yes)	2798	0.47	0.50	2606	0.43	0.50
Wife can refuse sex (1 = Yes)	2799	0.53	0.50	2598	0.49	0.50
Husband threatened (1 = Never)	2253	0.91	0.28	2252	0.88	0.32
Husband kick, drag, and beat (1 = Never)	2251	0.97	0.18	2251	0.94	0.24
Husband push or hit (1 = Never)	2251	0.94	0.23	2251	0.92	0.27
Husband insulted (1 = Never)	2253	0.73	0.44	2251	0.64	0.48

1.4.6 Multivariate analysis

Factor Analysis (FA) is a standard multivariate technique used in the literature for this type of exercise. FA explicitly assumes that the original variables measure an underlying latent construct that is not directly measurable, making it fit for this purpose. Here the original variables are defined as the linear combinations of the latent variables or factors. An example of a factor analysis model is presented in equation 1 below.

$$\begin{aligned} y_{1,i} &= \Omega_{1,1}F_{1,i} + \cdots + \Omega_{1,m}F_{m,i} + \varepsilon_{1,i} \\ y_{2,i} &= \Omega_{2,1}F_{1,i} + \cdots + \Omega_{2,m}F_{m,i} + \varepsilon_{2,i} \\ \vdots \quad & \quad \vdots \quad \quad \vdots \quad \quad \vdots \\ y_{n,i} &= \Omega_{n,1}F_{1,i} + \cdots + \Omega_{n,m}F_{m,i} + \varepsilon_{n,i} \end{aligned} \tag{1.1}$$

The *y*'s are the standardized value of the original variables. The *F's* are the common factors; they are uncorrelated and constant for each individual. The Ω's are the factor loadings associated with each factor; they measure the amount of variance in the variable explained by the factor. The sum of square factor loadings is an important statistic known as the eigenvalue. Eigenvalues quantify the amount of variance in the entire sample that each factor explains. A low eigenvalue implies the factor contributes little to explaining the variance in the original variables. The error term, ε, measures the amount by which an individual, as measured, differs from the average or predicted values. It also accounts for the possibility that people with comparable latent levels may have differing variable-specific scores.

This study uses an Exporartory Factory Analysis (EFA), where no prior assumptions are made about the relations among the factors. The factors and the associated factor loadings are all inferred from the data. For EFA to reduce the data into meaningful dimensions, there must be some strong intercorrelation in the original variables, and the variables should measure an underlying latent construct. It is recommended to objectively justify the appropriateness of data for factor analysis using tests such as Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) (Watkins, 2018). Bartlett's test tests the correlations in the original variables. The null hypothesis of Bartlett's test is that the correlation matrix observed in the data is not different from an identity matrix. The test has to produce a statistically significant result for factory analysis to be considered. The KMO test measures the common variance in the original variables and returns a value between 0 to 1. The higher the test value, the more suitable the data is for FA. KMO greater than 0.5 indicates that it is appropriate to proceed with FA (Dziuban & Shirkey, 1974). The results of the tests are shown below.

Table 1.3*:* Results for Bartlett's and KMO tests

Test	Wave 1	Wave 2
Bartlett test of sphericity		
Chi-square	5865.74	5665.50
Degrees of freedom	120	120
p-value	0.00	0.000
H_0: variables are not intercorrelated		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		
KMO	0.72	0.71

After establishing the appropriateness of the variables for data reduction, the next step is factor extraction. PCA is a widely used method for factor extraction (Polit & Beck, 2008). The idea is to extract all relevant factors until no further meaningful variance is left. The decision on how many factors to keep is based on the Kaiser criterion (Kaiser, 1960). The Kaiser criterion is to retain factors with eigenvalues greater than 1. An eigenvalue of less than 1 means the factor explains less variance than a single observed variable. The retained factors are rotated using the varimax rotation method to obtain clear patterns and enhance their interpretability.

Table 1.4 shows the number of retained factors and their eigenvalues, and Table 1.5 shows the rotated factor loadings or the correlation matrix between the factors and the original variables. For wave 1, the two retained factors explain 98.31% of the common variance in the original variables. The first factor explains 61%, and the second factor accounts for 38% of the common variance. The first factor has positive and high loading on all the variables categorized under freedom from violence and most of the variables under freedom of movement. This factor is therefore labeled

"*outcome*." The second factor loads highly and positively on most variables under power within and decision-making. This factor is labeled "*self-efficacy*."

The two factors retained in wave 2 capture 100% of the common variance. The first factor explains 65% of the variance and the second account for 35%. Here also, the first factor has positive and high loading on all the variables categorized under freedom from violence and most variables under freedom of movement. This factor is therefore labeled "outcome." The second factor is labeled "*self-efficacy*" since it loads highly and positively on most variables categorized under "power within" and decision-making.

Table 1.4. Factor Analysis: Principal factor method with varimax rotation

			Wave 1			Wave 2
			Number of obs = 2,145			Number of obs = 2,220
			Retained factors = 2			Retained factors = 2
			Number of params = 31			Number of params = 31
Factor	Variance	Difference	Proportion	Variance	Difference	Proportion
Factor1	2.27	0.86	0.61	2.22	1.02	0.65
Factor2	1.41		0.38	1.2		0.35
Total			0.98			1.01

Table 1.5. Rotated factor loadings

	Wave 1		**Wave 2**	
Variables	Factor1	Factor2	Factor1	Factor2
Wife can express her own opinion	0	0.02	-0.07	-0.03
Wife should tolerate beating	0.07	0.51	0.1	0.43
Better to school son than a daughter	-0.05	0.57	0	0.23
Man can refuse money	0.1	0.43	0.03	0.56
Does not trust with money	0.31	0	0.19	0.25
If woman refuses sex, man can beat you	0.07	0.52	-0.01	0.59
Important decisions by men	-0.04	0.5	0.01	0.24
Wife can refuse sex	-0.08	0	-0.05	-0.09
Wife can spend own money	-0.02	-0.09	-0.1	-0.05
Tried to limit contact with family	0.32	0.03	0.23	0.24
Demands to know where she is always	0.15	0.32	0.15	0.27
Accused of infidelity	0.36	-0.01	0.26	0.18
How often threatened	0.68	0.03	0.68	0.06

Variables	Wave 1		Wave 2	
	Factor1	Factor2	Factor1	Factor2
How often kicked, dragged, beat up	0.74	0.02	0.78	0
How often pushed, hit, slapped	0.83	0.01	0.85	0
How often insulted	0.43	0	0.46	0.1

Table 1.6. Factor rotation matrix

	Wave 1		Wave 2	
	Factor1	Factor2	Factor1	Factor2
Factor1	0.98	0.18	0.96	0.29
Factor2	-0.18	0.98	-0.29	0.96

1.4.7 Weighting and aggregation

The composite index of women's status is constructed as a weighted average of the retained factors (or dimensions). The dimensions are weighted using their proportion of variance in the retained factors they account for and then aggregated using a linear aggregation method (see equation (*1.2*) below). This weighting method ensures that the relative importance of each dimension in the final index is proportional to the amount of common variance it explains (OECD & JRC, 2008).

$$WomenStatus_{i,t} = (\frac{V_t^p}{V_t^s})Factor1_{i,t} + (\frac{1 - V_t^p}{V_t^s})Factor2_{i,t} \quad (1.2)$$

The subscripts *i* and *t* represent individual and time, respectively. V^p is the proportion of variance in the original variables explained by factor 1, and V^s is the sum of the proportion of variance in the original variables explained by all the retained factors. $\frac{V_t^p}{V_t^s}$ and $\frac{1-V_t^p}{V_t^s}$ represent the weights assigned to factors 1 and 2, respectively.

Factor 1 (*outcome*) explains 61%, and factor 2 (*self-efficacy*) explains 38% of the common variance in wave 1. They are assigned the weights 0.62 (0.61/[0.61+0.38]) and 0.39 (0.38/[0.61+0.38]), respectively. In wave 2, the retained factors explain 100% of the variance in the original variables, so each factor is assigned a weight equal to the proportion of variance in the original variables it explains. Thus factor 1 (*outcome*) and factor 2 (*self-efficacy*) are assigned the weights 0.65 and 0.35, respectively, in wave 2. Table 1.7 below shows the summary statistics of the individual dimensions (unweighted) and the composite index.

Table 1.7. Summary statistics of individual dimensions and composite index

Variable	Obs	Mean	Std. dev.	Min	Max
Wave 1					
Index of women's status	2,145	0.00	0.64	-3.79	0.52
Outcome	2,145	0.00	0.90	-5.27	0.50
Self-efficacy	2,145	0.00	0.80	-2.77	0.94
Wave 2					
Index of women's status	2,220	0.00	0.66	-3.31	0.58
Outcome	2,220	0.00	0.91	-3.86	0.69
Self-efficacy	2,220	0.00	0.77	-3.38	1.15

1.4.8 Uncertainty and sensitivity analysis

The final composite index is an outcome of a set of decisions made at various stages in the index construction process, such as the imputation of missing data, the choice of multivariate technique for dimension reduction, and the aggregation method. It is always imperative to check that these decisions do not unduly influence the final index and subsequent analysis using the index.

We reconstruct the composite index using Principal Component Analysis (PCA) to ensure that the index is invariant to the dimension reduction procedure. PCA and FA rely on similar techniques in extracting and retaining factors/components, although they both depend on different statistical assumptions. For example, FA tries to capture latent constructs in a set of observed variables. PCA

does not make assumptions about the underlying relationship. PCA converts a set of correlated variables into fewer components (or dimensions) that are linear combinations of the original variables. These components are uncorrelated, and each measures a different statistical dimension within the dataset. Like FA, The first component explains much of the variations in the data, then the second, and so forth.

Appendix A: Principal Component Analysis shows the results of the PCA. We retain five components in waves 1 and 2 based on the Kaiser criterion. The five components cumulatively explain 54.5% of the total variance in wave 1 and 54.84% in wave 2. The final composite index is a weighted average of the components. Table 1.19 in the Appendix A: Principal Component Analysis shows the summary statistics of the composite index and the individual components. Furthermore, to ensure the robustness of subsequent findings, we perform supplementary analyses using a regression-based approach described in Section 1.4.4 to replace all missing values in the composite index.

1.4.9 Links to other indicators

There is always the risk that the techniques used in constructing the index have not adequately captured the latent construct. Before using the composite index (and the dimensions) in empirical analysis, it is critical to validate them by examining their relationship with some commonly used variables.

The random effect estimates of the association between the index of women's status, its dimensions, and some proxies of women's status in the literature are displayed in Table 1.8. Results from the table indicate that the woman's education is positive and significantly associated with the composite index. A woman's education affects her earnings and employment potential,

influencing her outside options and fallback positions. Studies that use education to measure a woman's status include Smith et al. (2003) and Thomas (1994), among others.

Age married is also positively and significantly associated with the composite index. This is also to be expected, as early marriage limits women's ability to build self-sustenance capabilities (including education and training) and support networks outside their households (Smith et al., 2003).

Paid employment is positive, although the coefficient is not significant at any conventional level. Paid work is associated with earnings, access to information, and the ability to form social networks outside the household (Doss, 2013). Women in paid employment are more valuable to the household in terms of their contribution to household income and generally have better outside options than those that are not. However, in some cases, paid work might be associated with a higher workload for women due to the burden of domestic tasks. On the other hand, women who are full-time homemakers have limited outside options and tend to have worse fallback positions, which may explain why the coefficient is negative, although it is insignificant.

Dowry received correlates positively and significantly with the composite index. The dowry received at the time of marriage is commonly used to represent assets brought into the union by the woman. It is believed to influence the woman's decision-making authority within the household. Dowry received by the woman is employed in the literature both as an indicator and an instrumental variable for women's status (see Brown, 2009; Zhang & Chan, 1999; Thomas et al., 2002).

The results also show that mothers from matrilinear ethnic groups have higher status than those from other ethnic groups. Ethnicity defines norms of acceptable behavior, such as gender roles, marriage, divorce, and inheritance. They also define the power relations within and outside the

household. In matrilinear societies in Ghana, inheritance and kingship is through the mother's lineage, and women also take on leadership roles in society. This may explain the positive relationship between matrilinear ethnic groups and women's status. The findings also show that a woman's relative status in the household is affected by the type of marital union. For instance, legally married partners in most countries can seek legal remedies following divorce, which offers them more bargaining power than those in consensual unions. The association between women's status and polygamy is negative, although insignificant. Findings from other studies show that women in polygamous marriages have less say in decision-making and tend to be more accepting of domestic violence (Ickowitz & Mohanty, 2015).

Table 1.8. Correlates of the composite index of women's status and its dimensions

Dependent variables	**Woman's Status**	***Outcome***	***Self-efficacy***
VARIABLES	(1)	(2)	(3)
Mother's years of education	0.01***	0.01	0.02***
	(0.00)	(0.00)	(0.00)
Age married	0.01***	0.01***	-0.00
	(0.00)	(0.00)	(0.00)
Age	0.02***	0.02***	0.01***
	(0.01)	(0.01)	(0.01)
Age squared	-0.00***	-0.00**	-0.00*
	(0.00)	(0.00)	(0.00)
Homemaker	-0.01	0.02	-0.07***
	(0.02)	(0.03)	(0.02)
Paid employed	0.05	0.07	0.02
	(0.04)	(0.05)	(0.04)
Received dowry	0.07**	0.03	0.16***
	(0.04)	(0.05)	(0.04)
Matrilinear ethnicity	0.05*	0.02	0.10***
	(0.03)	(0.04)	(0.03)
Married (legal/customary union = 1)	0.30***	0.49***	-0.09***
	(0.03)	(0.03)	(0.02)
Polygamy	-0.03	-0.01	-0.09**
	(0.03)	(0.04)	(0.04)
District fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes

Dependent variables	Woman's Status	*Outcome*	*Self-efficacy*
VARIABLES	(1)	(2)	(3)
Observations	5,190	5,190	5,190
R-squared	0.11	0.11	0.25

Column (1) uses the composite index - a weighted average of the independent components - as the dependent variable. Columns (2) and (3) use the independent components *Outcome* and *Self-efficacy* as the dependent variables, respectively. Homemakers, paid employed, received dowry, matrilinear ethnicity, married, and polygamy are all dummy variables. Clustered standard errors in parenthesis. *** p<0.01, ** p<0.05, *p<0.1

An interesting finding in Table 1.8 is how the various proxies relate to the different dimensions of women's status. A mother's education significantly affects her *self-efficacy* (self-efficacy attributes and decision-making) more than her *outcome* (mobility rights and freedom from domestic violence). Age married has the opposite effect. It significantly affects the *outcome* dimension more than the *self-efficacy* dimension. This could be attributed to the fact that delaying marriage is more likely to influence a woman's ability to form social networks and access information outside the household. The relationship between age and the two dimensions is similar and non-linear. The dimensions increase as age increases in the early years and begin to decline in the latter years.

Furthermore, full-time homemakers have less *self-efficacy* than women in other occupations, although the association between the variable and the accomplishment dimension is insignificant. This lends credence to the claim that full-time homemakers may have less say in household decision-making and weaker self-efficacy attributes.

The woman's ethnicity and dowry significantly influence the *self-efficacy* but not the *outcome* dimension. The results on dowry corroborate findings in the intrahousehold literature that dowry received affects the mother's decision-making role in the household. As mentioned earlier, women in matrilinear ethnic groups are more likely to have favorable self-efficacy attributes and decision-making roles.

Interestingly, marital status has significant and opposite effects on the two dimensions. While married women have higher outcomes than non-married women, non-married mothers have higher *self-efficacy* than married women. This could be explained by the fact that women in legally recognized unions may have access to legal remedies in case of IPV and restrictions on their mobility, which may influence the *outcome* dimension. On the *self-efficacy* dimension, single women and those in consensual unions may have more autonomy and influence over decisions that concern themselves than women in legal unions due to the negotiations that take place in marriage.

Being in a polygamous marriage is associated with lower *outcome* and *self-efficacy*, although the effect is only significant on the *self-efficacy* dimension. This finding supports earlier assertions that women in polygamous unions have less say in decision-making and are more tolerant of IPV. Women in polygynous relationships have less decision-making power since decision-making and negotiations happen on multiple fronts with multiple partners compared to women in monogamous relationships.

1.5 Empirical Model and Estimation Strategy

This section presents the empirical model to examine the relationship between a mother's status and her child's health and cognitive outcomes. Child health outcomes are measured using height-for-age, weight-for-age, weight-for-height, stunting, underweight, wasting, illness, and the health index. Child cognitive outcomes are assessed using standardized values of English, math, digits forward, digits backward, Raven's test scores, and the cognitive index.

The panel data model in equation (1.3) below examines the relationship between the mother's status and the child's health and cognitive outcomes.

$$y_{it} = \alpha + \beta ws'_{it} + \gamma x'_{it} + \theta p'_{it} + \sigma z'_{it} + \tau D_i + \delta_t + \mu_i + \epsilon_{it} \quad (1.3)$$

Where y_{it} is the outcome variable of child i at time t; ws' is a vector of indices of the mother's status; x'_{it} represents a vector of child characteristics – age, years of education, and gender; p'_{it} represents a vector of mother characteristics – age, age-squared, and years of education; z'_{it} is a vector of household controls – household size, locality of residence (rural/urban), and household asset index; D_i is the district fixed effects; δ_t is the wave-specific effect; μ_i is a child-specific effect; and ϵ_{it} is the idiosyncratic error term.

The coefficient of interest is β, and the hypothesis is that $\beta > 0$ for child cognitive outcomes and $\beta < 0$ for child health outcomes. The time-invariant district fixed effects D_i removes any influence unobserved district heterogeneity may have on the estimation results. δ_t takes care of the time-specific effect that could potentially confound the estimates.

The model in equation (*1.3*) is estimated using Random Effect (RE) and Fixed Effect (FE) estimators. The RE estimate of the mother's status is efficient and consistent, assuming that the child-specific effect is uncorrelated with any of the variables of interest. The RE estimator is biased and inconsistent if otherwise. The FE estimator can consistently estimate the explanatory variables even if the child-specific effect and the error term are correlated. FE expunges the influence of time-invariant characteristics, which allows the assessment of the net impact of the mother's status on the child outcome variables. FE solely considers within-individual differences, thereby ignoring any information on differences between individuals. In contrast, RE uses both within and between individual information (Allison, 2009). Thus, if the explanatory factors are more likely to vary between individuals than over time for each individual, FE may result in inaccurate or intolerable standard errors. The RE estimator is usually preferred if one is sure that the child-specific effect is uncorrelated with the error term. This assumption is generally tested using the Dubin-Wu-Hausman (also Hausman) test. The Hausman test examines the trade-off between the FE's unbiasedness and the RE's efficiency. The null hypothesis of the Hausman test is that the two estimates do not differ significantly. Failure to reject the null implies the more efficient estimator, RE, is preferred, and rejection of the null implies the unbiased estimator, FE, is preferred. The Hausman tests are conducted without time-fixed effects and clustered standard errors as standard practice. The p-value of the Hausman test will be displayed together with the estimation results. Ideally, the choice of RE of FE should be guided by theory, and given the structure of our dataset and hypothesis, we tend to lean more toward FE estimates.

We cluster the standard errors at the individual level in the estimations to account for any potential serial correlation and heteroscedasticity. Due to the time-series nature of the dataset, some serial correlation is to be expected, although we don't expect it to be a major concern due to the time

difference between the two waves. Furthermore, clustering is essential for FE since any serial correlation might result in considerably inflated standard errors (Bertrand, Duflo, and Mullainathan, 2004).

1.6 Descriptive Statistic

Table 1.9 shows the descriptive statistics of all the variables used in this study. Detailed descriptive statistics by wave are presented in Appendix B. The information provided in the table is variable type (continuous, binary, or categorical), mean, standard deviation (Std. Dev.), and the minimum (min) and maximum (max) values of each variable. Variables related to the mother are displayed first, followed by the child and the household.

The Mother's status variable and its dimensions (*outcome*s and *self-efficacy*) are constructed from survey responses using factor analysis (*see* 1.4 for details). The values of these variables are standardized scores. The average age of mothers in the sample is 37. The youngest mother is 15 years, and the oldest is 94 years. About 42% of mothers in the sample have completed primary education. The average number of years spent in school is 4.13 – below the six years required to complete primary education in Ghana; the maximum is 16 years which corresponds to the number of years needed to complete tertiary education. 28% of mothers in the sample are full-time homemakers, and only 6% are in paid employment. 82% of the mothers received dowry or brought some form of assets into their marriage. The high number could be due to dowry being a norm in most cultures in the study area.

The average age of marriage is 21 years, above the legal marriage age of 18[1]. There are very few instances where a mother married at age 7. This practice is known as "*asiwa*" among the Akan people, although it is rarely practiced these days due partly to the enforcement of legal marital age. Available data from the SIGI database indicates only 8% of women under 18 years in Ghana are married (OECD, 2019b). Also, 73% of mothers are in legal or customarily recognized unions, and

[1] Ghana's Children's Act 560 (1998), Article 14(2)

the remaining are either in consensual unions, widowed, divorced, or single mothers. 12% of mothers are in polygynous relationships. Polygamy is illegal in Ghana under civil law, although it is permitted under customary laws.

Table 1.9: Summary statistics, all waves

Variable	Variable type	Mean	Std. Dev.	Min	Max
Mother variables					
Mother's Status	Continuous	0	0.68	-3.83	0.59
*Outcome*s	Continuous	0	0.93	-5.07	0.76
Self-efficacy	Continuous	0	0.78	-3.42	1.26
Mother's age	Continuous	37.07	10.51	15	94
Mother completed primary	Binary	0.42	0.49	0	1
Mother's years of education	Continuous	4.13	4.21	0	16
Homemaker	Binary	0.28	0.45	0	1
Paid employed	Binary	0.06	0.24	0	1
Received dowry	Binary	0.82	0.34	0	1
Age married	Continuous	21.00	4.19	7	44
Marital status (married = 1)	Binary	0.73	0.45	0	1
Polygyny	Binary	0.12	0.32	0	1
Child variables					
Age	Continuous	8.33	4.96	0	17
Female child	Binary	0.48	0.5	0	1
Child's years of education	Continuous	2.48	2.82	0	14
Height-for-age z-score (HAZ)	Continuous	-0.78	1.63	-4.99	4.97
Stunting	Binary	0.21	0.41	0	1
Weight-for-age z-score (WAZ)	Continuous	-0.12	1.79	-4.93	4.92
Underweight	Binary	0.14	0.34	0	1
Weight-for-height z-score (WHZ)	Continuous	0.18	2.01	-4.97	4.98
Wasting	Binary	0.16	0.33	0	1
Illness	Binary	0.09	0.29	0	1
Health index	Continuous	0	1	-0.62	3.85
Raven's matrix (raw scores)	Continuous	4.64	2.6	0	12
Raven's matrix (std. scores)	Continuous	0	1	-2.25	3.56
Digits forward (raw score)	Continuous	6.99	4.04	0	16
Digits forward (std. scores)	Continuous	0	1	-2.55	3.67
Digits backward (raw score)	Continuous	2.88	2.68	0	14
Digits backward (std. score)	Continuous	0	1	-1.51	8.1
English test (raw score)	Continuous	4.13	2.56	0	7
English test (std. score)	Continuous	0	1	-2.9	1.81
Math test (raw score)	Continuous	4.72	2.17	0	8
Math test (std. score)	Continuous	0	1	-3.14	2.32

Variable	Variable type	Mean	Std. Dev.	Min	Max
Cognitive index	Continuous	0	0.92	-2.61	5.25
Household variables					
Household size	Continuous	5.16	2.19	2	20
Urban	Binary	0.34	0.47	0	1
Asset index	Categorical	1.02	0.82	0	2

std. is standardized; Cont. is continuous; and Categ. is categorical.

The average age of children in the sample is around 8. The youngest child is under a year old, and the oldest is 17. 48% of the children are female. The average years of schooling among the children in the sample is about 2.48 years. The HAZ, WAZ, and WHZ compare children in the sample to a population of well-nourished children. They represent how a child in the sample differs (in terms of height, weight, and weight-for-height) in SD from a well-nourished child of the same age and gender. The negative mean values indicate children in the sample are, on average, less nourished given their age and gender. 21% of the children in the sample are stunted – significantly shorter for their age, 14% are underweight – suffering from acute weight loss, and 16% are wasted – severely thin for their age. Only 9% of children were reported ill or injured two weeks before the surveys.

The raw test scores vary regarding the maximum possible value a child can obtain, and all children, regardless of age, take the same test score, which informs the decisions to standardize by age. The maximum raw scores for Raven, digits forward, digits backward, English, and Math are 12, 16, 14, 7, and 8, respectively. Children, on average, correctly identified the shape that best completes the pattern 4.64 times out of 12 scenarios. On average, children correctly repeated 7 out of 16 sequences of numbers. The lowest scores were in digits backward – repeating a sequence of

numbers backward, where 2.9 sequences of numbers were correctly repeated backward. The average scores for both English and Math scores are 4.1 and 4.7, respectively

The average household size is 5.2, just above the world average of 4.9 but below the Sub-Saharan Africa average of 6.8[2]. The smallest household has just two people, and the largest has 20. 34% of households in the sample are located in urban areas, implying that most are rural households.

[2] Pew Research Center (2019)

1.7 Estimation Results

This section presents estimation results of the relationship between the mother's status, using the composite index and the two dimensions *outcome*s and *self-efficacy,* and child health and cognitive outcomes. Section 1.7.1 shows the results using child health outcomes – stunting, underweight, wasting, illness, and the health index – as dependent variables. Section 1.7.2 shows the results using child cognitive outcomes – standardized scores for Raven's, digits backward, digit forward, English, math, and cognitive index – as the dependent variables. The estimation results using the composite index from a PCA are presented in the supplementary analysis section of the appendix. We also show estimation results using WAZ, HAZ, and WHZ; the raw scores for Raven, digits backward, digit forward, English, and Math tests in the supplementary regression section of the appendix.

1.7.1 Child Health Outcomes

Table 1.10 shows the estimation results with the composite index as the primary explanatory variable. Table 1.11 shows the results using the two dimensions – *outcomes* and *self-efficacy* – as the main independent variables. In both tables, the outcome variables are the child health indicators – *underweight*, *stunting*, *wasting*, *illness*, and the *health index*. The RE and FE estimates are presented for each outcome variable, with the p-value of the Hausman test displayed in the last row. Additionally, all estimations control for mother characteristics, child characteristics, household characteristics, and time-fixed effects. The RE estimations also include district-fixed effects. The FE estimations do not have child gender, district, and residence locality, which are time-invariant.

The RE estimation results in the table show a negative relationship between the composite index of the mother's status and *underweight, stunting, illness,* and *health index*. The coefficients are significant at 10% for *underweight*, 5% for *stunting,* and 1% for *illness* and the *health index*. The RE estimate of the mother's status on *wasting* is not significant at any conventional level. The FE estimate of the mother's status has the expected sign in four out of five columns. The coefficient is significant at 1% for *illness* and 5% for the *health index.* The FE estimates for the coefficient of the mother's status are not significant for *stunting, underweight,* and *wasting*. Generally, the standard errors of the FE estimates are expected to be larger than the RE estimates. Additionally, the p-value of the Hausman test suggests that the coefficients of the RE and FE are systematically different for all outcome variables except *illness*. Hence the FE estimates are more desirable.

The results in Table 1.10 indicate that holding all other variables constant, a one SD increase in the composite index reduces the probability of illness by two percentage points and improves the child's health index by 0.05 SD. Overall, the index of the mother's status is associated with better health outcomes for her children. This finding is consistent with studies examining the relationship between women's status and child nutrition and health outcomes, albeit using different indicators (Smith et al., 2003; Smith & Haddad, 2015; Thomas, 1990).

Table 1.10. Mother's status and child health outcomes

Dependent variables	Illness		Stunting		Underweight		Wasting		Health index	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Mother's status	-0.02***	-0.02***	-0.01**	-0.02	-0.01*	0.00	-0.00	-0.00	-0.05***	-0.05**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
Female child	-0.00		-0.07***		-0.03***		-0.04***		-0.14***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.02)	
Child age	-0.01***	-0.01*	0.01***	0.11***	0.01***	0.08***	0.01***	0.06***	0.02***	0.21***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)
Mother's education	0.00	-0.00	-0.01***	-0.00	-0.00***	-0.00	-0.00***	-0.00	-0.01***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Mother's age	0.00	0.00	-0.01***	0.01	-0.01**	-0.01	-0.01***	-0.01**	-0.02***	-0.01
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Mother's age squ.	-0.00	-0.00	0.00**	-0.00	0.00*	0.00	0.00***	0.00*	0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.00***	-0.00	0.01**	-0.01	0.01***	0.00	0.00	-0.01	0.01*	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Wealth index = Mid	0.02***	0.02*	-0.03**	-0.01	-0.01	0.01	0.00	0.01	-0.01	0.04
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.04)
Wealth index = High	0.02***	0.02	-0.05***	0.01	-0.01	0.02	-0.00	0.03	-0.04	0.06
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.03)	(0.05)
Urban	-0.03**		-0.04***		-0.06***		-0.04***		-0.16***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.03)	
District FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,814	11,814	9,873	9,874	10,368	10,368	10,734	10,734	11,825	11,825
R-squared	0.05	0.01	0.07	0.11	0.05	0.08	0.04	0.05	0.05	0.08
Hausman test	0.12		0.00		0.00		0.00		0.00	

RE and FE are Random Effects and Fixed Effects, respectively. Stunting, Underweight, and Wasting are 1 if HAZ, WAZ, and WHZ, respectively, are below -2 SD, and 0 otherwise. Higher values of the health index denote poor health outcomes. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.11 examines the effect of the two dimensions, *outcome*s and *self-efficacy*, on child health outcomes. The RE estimate of the coefficient of *outcome* is negative on all outcome variables except wasting. The coefficient is significant at 10% for both *stunting* and *underweight* and 1% for *illness* and the *health index*. The FE estimate of the coefficients of *outcome* have the expected sign, and compared to the RE, they are marginally larger in magnitude and standard errors. The FE estimates are significant at 10% for *stunting* and *underweight* and 1% for *illness* and the *health index*. The coefficients are not significant at any conventional level for both underweight and wasting.

The RE estimates of the *self-efficacy* dimension are negative in four out of five columns, although they are insignificant in all columns. The FE estimates, however, do not seem to have a consistent sign. Surprisingly they are marginally significant and positive on *wasting* and *underweight*, although the effect on the overall *health index* is not significant. The verdict of the Hausman test is that the FE estimates are more appropriate in almost all cases. The interpretation of the results implies that holding all other things constant (including the *self-efficacy* domain), a one SD increase in the *outcome* domain reduces the probability of *illness* and *stunting* by two percentage points and improves the overall *health index* by 0.06 SD. A one SD increase in the *self-efficacy* dimension increases the likelihood of *wasting* and *underweight* by two percentage points.

The estimation results using the two dimensions indicate that the *outcome* dimension is the most significant for child health outcomes, holding all other variables constant. Understanding the components that go into both dimensions is essential to understand this further. The *outcome* dimension comprises variables related to mobility, mobility rights, and incidence and threats of IPV. Freedom of movement, for instance, impacts the ability of the woman to seek information regarding best care practices for the child or immediate medical attention when the child is ill. It

also influences a woman's ability to join or access support from her social networks, which are a crucial source of information in some societies. Also, the relationship between IPV and child health outcomes is well-established in the literature. Mothers exposed to abuse are at higher risk of poor mental and physical health conditions, which impedes their ability to offer good care practices to their children.

Regarding the other variables in the model, the child variables seem to have the expected signs. Both the RE and FE estimates are significant in almost all columns. The FE estimates of the *female child* variable are unavailable because the variable is time-invariant. The RE results indicate that girls in the sample are less likely to be underweight, stunted, or ill, which is consistent with findings from studies on nutrition (Thurstans et al., 2020). Also, older children are more likely to be stunted and underweight than younger children; the opposite holds for wasting and illness. It is noted in the literature that the incidence of stunting and underweight are more prevalent in older than younger children (Geberselassie et al., 2018, Rakotomanana et al., 2017; Lee & Ham, 2015), and younger children are more likely to be ill due to less developed immune systems.

For the other mother variables in the model, the RE estimates show that they have the expected signs. For instance, a mother's years of schooling significantly affect *underweight*, *stunting*, and the overall *health index*. This finding corroborates well-known evidence in the literature that educated mothers have children with better health outcomes (Desai & Alva, 1998). Some of the reasons usually attributed to this is that educated mothers are more receptive to modern medicine and can better understand medical instructions for treating their children. Also, education is related to better jobs and living conditions for the mother, which may also affect the child's health. The relationship between the mother's age and the child health outcomes in the model is significant and non-linear. The results suggest that good health outcomes increase with the mother's age in

her early years, likely as she gains more parenting experience, and then decline in later years when she might not be physically able to do so. The FE estimates of the mother's characteristics are hardly significant at any conventional level. This likely demonstrates that the variables vary more between mothers in the sample than they do for the same mother across time. For instance, the mother's years of education will likely be constant across the time for most mothers in the sample, although there are huge variations across mothers. Also, the mother's age changes by the same magnitude for all mothers, all other things equal.

The RE estimates of the household-level characteristics reveal that children in larger households are more prone to being underweight and stunted, although they are less likely to be ill. The finding on nutritional outcomes may be related to larger families being resource constrained compared to smaller ones, all other things being equal. Unsurprisingly, children in wealthier households and those in urban areas have superior health outcomes. Household wealth and urban residency are likely to be associated with better living conditions and access to health facilities. Again, the FE estimates for household characteristics are mostly insignificant. A possible reason could be that household size and wealth are more likely to differ between households than to vary over time for the same household.

Table 1.11. Dimensions of mother's status and child health outcomes

Dependent variables	**Illness**		**Stunting**		**Underweight**		**Wasting**		**Health index**	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Outcome	-0.01***	-0.02***	-0.01*	-0.02*	-0.01*	-0.01	-0.00	-0.01	-0.04***	-0.06***
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Self-efficacy	-0.01	-0.00	-0.01	0.01	0.00	0.02*	-0.00	0.02*	-0.01	0.03
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Female child	-0.00		-0.07***		-0.03***		-0.04***		-0.14***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.02)	
Child age	-0.01***	-0.01*	0.01***	0.11***	0.01***	0.08***	0.01***	0.06***	0.02***	0.21***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)
Mother's education	0.00	-0.00	-0.01***	-0.00	-0.00***	-0.00	-0.00**	-0.00	-0.01***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Mother's age	0.00	0.00	-0.01***	0.01	-0.01**	-0.01	-0.01***	-0.01**	-0.02***	-0.01
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Mother's age squared	-0.00	-0.00	0.00**	-0.00	0.00*	0.00	0.00***	0.00*	0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.00***	-0.00	0.01**	-0.01	0.01***	0.00	0.00	-0.01	0.01*	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Wealth index = Mid	0.02***	0.02*	-0.03**	-0.01	-0.01	0.01	0.00	0.01	-0.01	0.04
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.04)
Wealth index = High	0.02***	0.02	-0.05***	0.01	-0.01	0.02	-0.00	0.03	-0.04	0.06
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.03)	(0.05)
Urban	-0.03**		-0.04**		-0.06***		-0.04***		-0.16***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.03)	

Dependent variables	Illness		Stunting		Underweight		Wasting		Health index	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
District FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,814	11,814	9,873	9,874	10,368	10,368	10,734	10,734	11,825	11,825
R-squared	0.05	0.01	0.07	0.11	0.05	0.08	0.04	0.05	0.05	0.08
Hausman test	0.14		0.00		0.00		0.00		0.00	

RE and FE are Random Effects and Fixed Effects, respectively. Stunting, Underweight, and Wasting are 1 if HAZ, WAZ, and WHZ, respectively, are below -2 SD, and 0 otherwise. Higher values of the health index denote poor health outcomes. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.7.2 Child Cognitive Outcome

This section presents the estimation results on the relationship between the mother's status, its domains – *outcome*s and *self-efficacy,* and child cognitive outcomes. Table 1.12 assesses the relationship between the composite index and child cognitive outcomes. Table 1.13 looks at the relationship between the different domains and child cognitive outcomes. In all tables, the outcome variables are standardized values of English, maths, digits backward, digits forward, Raven's matrix, and the cognitive index. The RE and FE estimates are presented for each outcome variable, with the p-value of the Hausman test displayed in the last row. Also, all estimations control for mother characteristics, child characteristics, household characteristics, and time-fixed effects. The RE estimations also include district-fixed effects. The FE estimations do not have child gender, district fixed effect, and residence locality, which are time-invariant

Results from Table 1.12 indicate that the compositive index of the mother's status is associated with all the outcome variables with the expected signs. The RE estimate of the composite index of the mother's status is significant at 5% for English and math and 1% for *digits backward, digits forward, Raven's matrix,* and the *cognitive index*. The RE estimates suggest a one SD increase in the composite index is associated with an SD increase between 0.05 and 0.11 in the cognitive test scores, with all other variables being held constant. The FE estimates show that the composite index of the mother's status is positively and significantly associated with four out of six outcome variables with the expected sign, including the overall *cognitive index*. The coefficient is significant at 5% for the *English* and *digits forward* and 1% for *digits backward* and the *cognitive index*. The coefficient is insignificant for both *math* and *Raven's matrices* at conventional levels. The *p-value* of the Hausman test implies that there are systematic differences between the FE and RE estimates in all cases, implying the FE estimates are more desirable. The FE results indicate

that a one SD change in the mother's status is associated with a 0.12 SD increase in *English* scores, a 0.10 SD increase in *digits backward*, a 0.09 increase in *digits forward*, and a 0.08 SD increase in the *compositive index*. The results in Table 1.12 imply that a mother's relative position in the household strongly predicts her child's cognitive outcomes, even after controlling for all relevant child, mother, and household characteristics. This finding corroborates the findings of Lavy et al. (2020). Lavy et al. (2020) examined the impact of a program designed to empower women and improve children's education in Ecuador. The study found that the program enhanced female children's language and math test scores. However, since the program simultaneously targeted women's status and children's education, it is quite complicated to attribute the improvement in test scores directly to women's empowerment.

Table 1.12. Mother's status and child cognitive outcomes

Dependent variables	English		Math		Digits backward		Digits forward		Raven's matrix		Cognitive Index	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Mother's status	0.05**	0.12**	0.05**	0.00	0.10***	0.10***	0.11***	0.09**	0.06***	0.02	0.09***	0.08***
	(0.02)	(0.06)	(0.02)	(0.05)	(0.02)	(0.03)	(0.02)	(0.04)	(0.02)	(0.04)	(0.01)	(0.03)
Female child	-0.03		-0.11***		-0.03		-0.06***		-0.08***		-0.07***	
	(0.03)		(0.03)		(0.02)		(0.02)		(0.02)		(0.02)	
Child age	-0.13***	-0.11***	-0.12***	-0.10***	-0.09***	-0.09***	-0.08***	-0.16***	-0.06***	-0.10***	-0.12***	-0.17***
	(0.01)	(0.04)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Child's education	0.18***	0.06**	0.18***	0.08***	0.16***	0.09***	0.14***	-0.02	0.10***	0.04*	0.19***	0.10***
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Mother's education	0.02***	0.01	0.02***	-0.00	0.01***	0.01	0.02***	0.03*	0.01***	0.00	0.02***	-0.00
	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)
Mother's age	0.01	-0.01	0.01	0.02	0.01	0.04*	0.01	0.01	0.01	0.04	0.02***	0.03
	(0.01)	(0.05)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
Mother's age squared	-0.00	0.00	-0.00	-0.00	-0.00	-0.00**	-0.00	-0.00	-0.00*	-0.00	-0.00***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.02***	-0.04	-0.01*	-0.03	-0.02***	-0.04**	-0.01***	-0.02	-0.02***	0.03	-0.02***	-0.01
	(0.01)	(0.03)	(0.01)	(0.03)	(0.00)	(0.02)	(0.00)	(0.02)	(0.01)	(0.02)	(0.00)	(0.02)
Wealth index = Mid	0.08**	-0.05	0.07**	0.07	-0.02	0.08	0.01	-0.05	0.16***	0.20***	0.08***	0.08
	(0.03)	(0.10)	(0.03)	(0.09)	(0.03)	(0.06)	(0.03)	(0.07)	(0.03)	(0.07)	(0.02)	(0.06)
Wealth index = High	0.19***	0.04	0.13***	-0.02	0.06*	-0.07	0.04	-0.22***	0.20***	0.22**	0.16***	0.02
	(0.04)	(0.13)	(0.04)	(0.11)	(0.03)	(0.09)	(0.03)	(0.08)	(0.03)	(0.09)	(0.03)	(0.07)
Urban	0.36***		0.24***		0.32***		0.22***		0.14***		0.33***	
	(0.05)		(0.04)		(0.04)		(0.04)		(0.04)		(0.03)	
District FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,153	4,154	4,597	4,598	6,653	6,653	6,700	6,700	6,714	6,714	6,593	6,593
R-squared	0.38	0.10	0.29	0.06	0.26	0.05	0.26	0.07	0.16	0.03	0.39	0.10
Hausman test p-value	0.00		0.00		0.00		0.00		0.00		0.00	

English, Math, Digits backward, Digits forward, and Raven's matrix are standardized scores of the respective tests. The cognitive index is from the factor analysis of the test scores. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.13 presents the estimation results examining the relationship between the *outcome* and *self-efficacy* dimensions of mother's status and child cognitive outcomes. The findings show that both dimensions influence the outcome variables, although they differ in magnitude and statistical significance.

The RE estimate of the *outcome* domain is positive and significant at 5% for math, and 1% for *digits backward*, *digits forward*, and the *cognitive index*. The FE estimate is marginally significant for *English* test scores and insignificant for all other tests and the overall *cognitive index*. The RE estimate of the *self-efficacy* dimension is significant at 1% for *English*, *digits backward*, *digits forward*, *Raven's matrix*, and the *cognitive index*. The FE estimate of the *self-efficacy* domain is significant at 1% for *digits backward*, *digits forwards*, and the *cognitive index*. The p-value of the Hausman test indicates that the FE results are more consistent. Using the FE estimates, a one SD increase in *outcome* raises English test scores by 0.08 SD. And a one SD increase in *self-efficacy* improves *digits backward* score by 0.12 SD, *digits forward* by 0.18 SD, and the *cognitive index* by 0.11. This result suggests that the *self-efficacy* dimension is more impactful for child cognitive outcomes than the *outcome* dimension. This finding is contrary to Table 1.11, where the *outcome* dimension had considerably more influence on child health outcomes than the *self-efficacy* dimension.

Also, the child characteristics in the model are significant in almost all columns. The RE results show gender differences in all test scores except *English* and *digits backward*. The results reveal that boys performed better than girls in all tests with significant gender differences. Other studies find that girls usually outperform boys on language tests while boys do better on math tests (Niederle & Vesterlund, 2010; Cornwell, Mushard, & Van Parys, 2013). Also, the FE and RE

estimates of *child age* are negative and significant. The *child age* variable is most likely capturing the effect of delayed schooling or grade repetition since the model also controls for the child's years of schooling. The results imply younger children in a given cohort had better cognitive outcomes than older ones. The child's years of *education* are positively correlated with cognitive scores, as expected.

For the mother characteristics, the RE estimate of *mother's education* is positive and significant at 1 % for all test scores. As mentioned earlier, the mother's education is associated with good welfare outcomes for the mother, which could considerably influence the child's cognitive development. The FE estimates of *mother's education* are only significant for *digits forward* and insignificant for all other test scores. The RE estimate of the mother's age is only significant for the overall *cognitive index,* and the FE estimate is marginally significant for *digits backward* and the overall *cognitive index*. Addo et al. (2016) show that the mother's age is essential in predicting her child's graduation from high school. Duncan et al. (2008) also find that school achievement rises by 0.02 to 0.04 SD each year that a mother postpones having her first child.

Regarding household-level characteristics, the findings indicate that *household size* is negatively associated with cognitive development. This could be due to the claim that larger households are more likely to be resource constrained, all other things being equal. The RE estimates of the *wealth index* and *urban* indicate that children from wealthier households and those in *urban* areas had better cognitive outcomes. Household wealth and living in urban areas are associated with better environmental quality and access to education and health facilities. The FE estimate of the *wealth index* is positive for *Raven's* test and negative for *digits forward*. However, the effect on the *cognitive index* is positive and not significant at any conventional level.

Table 1.13. Dimensions of mother's status and child cognitive outcomes

Dependent variables	**English**		**Math**		**Digits backward**		**Digits forward**		**Raven's matrix**		**Cognitive Index**	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Outcome	0.02	0.08*	0.03**	-0.01	0.05***	0.02	0.05***	-0.01	0.01	-0.00	0.04***	0.01
	(0.02)	(0.05)	(0.02)	(0.04)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.02)
Self-efficacy	0.06***	0.05	0.01	0.03	0.09***	0.12***	0.11***	0.18***	0.09***	0.04	0.09***	0.11***
	(0.02)	(0.05)	(0.02)	(0.04)	(0.01)	(0.03)	(0.01)	(0.03)	(0.02)	(0.03)	(0.01)	(0.02)
Female child	-0.03		-0.11***		-0.03		-0.06***		-0.08***		-0.07***	
	(0.03)		(0.03)	(0.51)	(0.02)		(0.02)		(0.02)		(0.02)	
Child age	-0.13***	-0.11***	-0.12***	-0.10***	-0.09***	-0.09***	-0.08***	-0.16***	-0.06***	-0.10***	-0.12***	-0.17***
	(0.01)	(0.04)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Child's education	0.18***	0.06**	0.18***	0.08***	0.16***	0.10***	0.14***	-0.01	0.10***	0.04*	0.19***	0.11***
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Mother's education	0.01***	0.01	0.02***	-0.00	0.01***	0.02	0.02***	0.03**	0.01***	0.00	0.02***	0.00
	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)
Mother's age	0.01	-0.01	0.01	0.02	0.01	0.04*	0.01	0.01	0.01	0.04	0.02***	0.03*
	(0.01)	(0.05)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
Mother's age squared	-0.00	0.00	-0.00	-0.00	-0.00	-0.00**	-0.00	-0.00	-0.00*	-0.00	-0.00***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.02***	-0.04	-0.01*	-0.02	-0.02***	-0.04*	-0.01***	-0.02	-0.02***	0.03	-0.02***	-0.00
	(0.01)	(0.03)	(0.01)	(0.03)	(0.00)	(0.02)	(0.00)	(0.02)	(0.01)	(0.02)	(0.00)	(0.02)
Wealth index = Mid	0.08**	-0.05	0.07**	0.07	-0.02	0.08	0.01	-0.05	0.16***	0.20***	0.08***	0.08
	(0.03)	(0.10)	(0.03)	(0.09)	(0.03)	(0.06)	(0.03)	(0.06)	(0.03)	(0.07)	(0.02)	(0.05)
Wealth index = High	0.19***	0.04	0.13***	-0.01	0.06*	-0.07	0.04	-0.22***	0.20***	0.22**	0.16***	0.02
	(0.04)	(0.13)	(0.04)	(0.11)	(0.03)	(0.09)	(0.03)	(0.08)	(0.03)	(0.09)	(0.03)	(0.07)
Urban	0.35***		0.24***		0.31***		0.22***		0.13***		0.33***	
	(0.05)		(0.04)		(0.04)		(0.04)		(0.04)		(0.03)	

Dependent variables	**English**		**Math**		**Digits backward**		**Digits forward**		**Raven's matrix**		**Cognitive Index**	
	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
District FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,153	4,154	4,597	4,598	6,653	6,653	6,700	6,700	6,714	6,714	6,593	6,593
R-squared	0.38	0.10	0.29	0.06	0.27	0.05	0.27	0.09	0.17	0.03	0.39	0.12
Hausman test p-value	0.01		0.00		0.00		0.00		0.00		0.00	

English, Math, Digits backward, Digits forward, and Raven's matrix are standardized scores of the respective tests. The cognitive index is from the factor analysis of the test scores. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.8 Conclusion

This study examines the relationship between a mother's status in the household and her child(ren)'s development outcomes. A composite index of women's status, and its independent dimensions, are constructed using multiple indicators of self-efficacy, decision-making, mobility, and IPV. The measure covers more spheres of influence in the household than 'static' and unidimensional measures of women's status, usually employed in the literature. It is also more relevant in developing country contexts since it inherently captures social norms and cultural contexts, which have received less attention in the empirical literature.

Two dimensions of the mother's status – *outcome* and *self-efficacy* – were derived using factor analysis. The outcome dimension encompasses the mother's mobility rights and the incidence or threats of IPV. A composite index of the mother's status was calculated as a weighted average of the two dimensions.

We examine the relationship between the composite index and other traditional measures of women's status. The findings show that the mother's years of education, age married, age, dowry received, belonging to a matrilinear ethnic group, and being in a legal or customary union had a significantly positive association with the composite index. For the independent dimensions, age married, age, and legal or customary union are positively associated with the *outcome* dimension. The *self-efficacy* dimension is positively associated with years of education, age, dowry received, and matrilinear ethnicity; and negatively associated with full-time homemaker, legal or customary union, and polygyny.

We then examine the relationship between the index and child development outcomes. The empirical findings indicate that the mother's relative status in the household is a significant determinant of her child's health and cognitive outcomes. Furthermore, the study finds that two

dimensions of the mother's status – *self-efficacy* and *outcome*s – affect measures of child development differently. The *outcome* dimension is more significant for her child's health outcomes, and the *self-efficacy* dimension was more significant for the child's overall cognitive development.

This study contributes to the literature in multiple ways. First, the study contributes to the ongoing search for a holistic measure of women's status by proposing a multi-dimensional and context-relevant measure. Secondly, the study is one of the few to establish a robust empirical relationship between a mother's relative status in the household and her child's cognitive outcomes. Most of the findings in the literature on this topic have mainly been suggestive. Furthermore, the result that separate dimensions of the mother's status influence child development differently opens up new possibilities and offers new insights into designing and evaluating child-focused programs. A well-curated intervention to target specific dimensions of the mother's status could be more effective and cost-efficient in improving specific aspects of child development. For policy and program evaluations, this finding could help improve decisions on which indicators to track in assessing the effectiveness of interventions that simultaneously target women and children.

1.9 Appendix

1.9.1 Appendix A: Principal Component Analysis

Table 1.14. Principal components with varimax rotation

	Wave 1 Number of obs = 2,145 Number of comp. = 5 Rho = 0.5450			Wave 2 Number of obs = 2,220 Number of comp. = 5 Rho = 0.5284		
Component	Variance	Difference	Proportion	Variance	Difference	Proportion
Comp1	2.43	0.26	0.15	2.51	0.84	0.16
Comp2	2.17	0.57	0.14	1.67	0.06	0.1
Comp3	1.6	0.21	0.1	1.61	0.27	0.1
Comp4	1.39	0.27	0.09	1.34	0.01	0.08
Comp5	1.12		0.07	1.33		0.08
Total			0.55			0.53

Table 1.15. Rotated components, wave 1

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Wife can express her own opinion	0.04	0.1	0.08	0.21	0.67	0.4
Wife should tolerate beating	0.09	0.43	-0.09	0.11	-0.04	0.55
Better to school son than a daughter	-0.04	0.46	-0.08	0.04	-0.14	0.48
Man can refuse money	-0.01	0.41	0.15	-0.23	0.24	0.51
Does not trust with money	-0.01	-0.03	0.52	0.04	-0.09	0.55
If woman refuses sex, man can beat you	-0.02	0.46	0.09	-0.24	0.15	0.45
Important decisions by men	0.01	0.4	-0.12	0.31	-0.12	0.48
Wife can refuse sex	-0.03	0	0	0.65	0.05	0.39
Wife can spend own money	0	-0.06	0.06	0.52	0.16	0.56
Tried to limit contact with family	-0.02	0.02	0.58	-0.01	0.05	0.49
Demands to know where she is always	-0.02	0.21	0.17	0.17	-0.56	0.43
Accused of infidelity	0.03	-0.02	0.54	0.01	0.01	0.52
How often threatened	0.51	0.01	0.02	0.01	-0.01	0.36
How often kicked, dragged, beat up	0.55	0.01	-0.04	-0.02	0.05	0.28
How often pushed, hit, slapped	0.58	0	0	-0.03	0.05	0.19
How often insulted	0.3	-0.06	0.09	0.06	-0.28	0.63

Table 1.16. Component rotation matrix, wave 1

	Comp1	Comp2	Comp3	Comp4	Comp5
Comp1	0.8377	0.2470	0.4693	-0.0532	-0.1194
Comp2	-0.2217	0.9611	-0.1315	0.0265	-0.0954
Comp3	0.1137	0.0234	-0.0351	0.9510	0.2845
Comp4	-0.4829	-0.0209	0.8384	0.1498	-0.2026
Comp5	-0.0555	0.1193	0.2416	-0.2640	0.9245

Table 1.17. Rotated components, wave 2

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Wife can express her own opinion	0.05	-0.15	0.04	0.13	0.52	0.58
Wife should tolerate beating	0.07	-0.04	0.29	0.41	-0.04	0.54
Better to school son than a daughter	-0.06	0.07	-0.08	0.6	0	0.53
Man can refuse money	0.02	0.01	0.66	-0.07	-0.02	0.3
Does not trust with money	0	0.41	0.08	0	-0.08	0.68
Man can beat you if you refuse sex	-0.02	0.01	0.65	0.03	0.03	0.31
Important decisions by men	0	-0.06	-0.02	0.62	0.01	0.49
Wife can refuse sex	-0.01	0.09	-0.11	0.05	0.6	0.49
Wife can spend own money	-0.03	0.03	0.1	-0.15	0.6	0.5
Tried to limit contact with family	0.02	0.46	-0.04	0.12	-0.01	0.61
Demands to know where she is always	-0.07	0.53	0.08	-0.04	0.04	0.53
Accused of infidelity	0.04	0.51	-0.04	-0.05	0.04	0.55
How often threatened	0.49	0.05	-0.04	0.04	-0.02	0.36
How often kicked, dragged, beat up	0.55	-0.06	0.03	-0.05	0	0.26
How often pushed, hit, slapped	0.57	-0.02	0.01	-0.05	0	0.2
How often insulted	0.33	0.15	-0.07	0.1	0.04	0.62

Table 1.18. Component rotation matrix, wave 2

	Comp1	Comp2	Comp3	Comp4	Comp5
Comp1	0.8383	0.4506	0.2243	0.1659	-0.1280
Comp2	-0.4109	0.2073	0.7575	0.4616	-0.0362
Comp3	0.3309	-0.7274	0.1378	0.4264	0.4006
Comp4	-0.0710	0.4407	-0.1264	0.0157	0.8857
Comp5	-0.1176	0.1749	-0.5839	0.7598	-0.1932

Table 1.19. Summary statistics of women's status (PCA) and components

Variable	Obs	Mean	Std. dev.	Min	Max
Wave 1					
Composite Index of women's status	2,145	0.00	0.71	-4.41	0.81
Component 1	2,145	0.00	1.56	-7.71	0.90
Component 2	2,145	0.00	1.47	-5.42	1.62
Component 3	2,145	0.00	1.27	-8.71	1.16
Component 4	2,145	0.00	1.18	-2.64	3.14
Component 5	2,145	0.00	1.06	-3.49	2.63
Wave 2					
Composite Index of women's status	2,220	0.00	0.72	-3.97	0.93
Component 1	2,220	0.00	1.58	-6.22	1.16
Component 2	2,220	0.00	1.29	-5.56	1.73
Component 3	2,220	0.00	1.27	-4.60	1.45
Component 4	2,220	0.00	1.16	-3.99	1.91
Component 5	2,220	0.00	1.15	-2.80	1.82

Table 1.20. Correlates of Mother's status (PCA)

VARIABLES	Mother's status
Mother's education	0.02***
	(0.00)
Age married	0.01**
	(0.00)
Mother's age	0.02***
	(0.01)
Mother's age squared	-0.00**
	(0.00)
Homemaker	-0.01
	(0.03)
Paid employed	0.06
	(0.04)
Received dowry	0.09**
	(0.04)
Matrlinear	0.10***
	(0.03)
Married	0.29***
	(0.03)
Polygamy	-0.07**
	(0.04)
Constant	-0.94***

	(0.14)
District FE	Yes
Time FE	Yes
Observations	5,088
R-squared	0.12

Homemakers, paid employed, received dowry, matrilinear ethnicity, married, and polygamy are all dummy variables. Clustered standard errors in parenthesis. *** p<0.01, ** p<0.05, *p<0.1

1.9.2 Appendix B: Summary Statistics By Wave

Table 1.21. Summary statistics, wave 1

Variables	Observations	Mean	SD	Min	Max
Mother variables					
Mother's status	2800	0	0.687	-3.827	0.589
Outcome	2800	0	0.929	-5.065	0.663
Agency	2800	0	0.796	-2.898	1.005
Mother's age	2,799	36.60	10.39	15	85
Mother completed primary	2959	0.418	0.493	0	1
Years of schooling	2918	4.096	4.313	0	16
Homemaker	2959	0.24	0.427	0	1
Paid employed	2959	0.053	0.224	0	1
Received dowry	2906	0.967	0.136	0	1
Age married	2,429	20.88	4.19	8	42
Married	2917	0.736	0.441	0	1
Child variables					
Age	8818	8.241	4.992	0	17
Female child	8818	0.489	0.5	0	1
Child's years of education	6944	2.574	2.848	0	14
Height-for-age z-score	7391	-0.841	1.649	-4.992	4.971
Stunting	7391	0.228	0.42	0	1
Weight-for-age z-score	4895	-0.141	1.849	-4.933	4.922
Underweight	4895	0.148	0.355	0	1
Raven's cognitive matrix (raw score)	5021	4.974	2.556	0	12
Raven's cognitive matrix (standardized score)	4976	0	0.999	-2.247	3.509
Digits forward (raw score)	5030	6.446	4.289	0	16
Digits forward (standardized scores)	4988	0	0.999	-2.162	3.672
Digits backward (raw score)	4954	2.382	2.617	0	14
Digits backward (standardized score)	4915	0	0.999	-1.434	8.095
English test (raw score)	2480	4.714	2.188	0	7
English test (standardized score)	2428	0	0.998	-2.9	1.556
Math test (raw score)	3215	5.049	1.985	0	8
Math test (standardized score)	3143	0	0.999	-3.142	2.316
Household variables					
Household Size	2704	5.276	2.239	2	20
Locality of residence (urban =1)	2704	0.338	0.473	0	1
Polygamous	2704	0.071	0.256	0	1
Asset index	2520	0.808	0.777	0	2

Table 1.22. Summary statistic, wave 2

Variables	Observations	Mean	SD	Min	Max
Mother variables					
Woman's Status	2605	0	0.678	-3.342	0.574
Outcome	2605	0	0.92	-3.906	0.764
Agency	2605	0	0.769	-3.424	1.264
Mother's age	2,605	37.57	10.77	15	94
Mother completed primary	2617	0.412	0.492	0	1
Years of schooling	2542	4.127	4.214	0	12
Homemaker	2617	0.326	0.469	0	1
Paid employed	2617	0.071	0.258	0	1
Received dowry	2612	0.653	0.408	0	1
Age married	2,102	21.14	4.19	7	44
Married	2616	0.716	0.451	0	1
Polygamy	2617	0.121	0.326	0	1
Child variables					
Age	7081	8.45	4.922	0	17
Female child	7081	0.474	0.499	0	1
Child's years of education	6056	2.37	2.782	0	12
Height-for-age z-score	5842	-0.713	1.609	-4.99	4.91
Stunting	5842	0.195	0.396	0	1
Weight-for-age z-score	3738	-0.084	1.708	-4.917	4.92
Underweight	3738	0.12	0.325	0	1
Raven's cognitive matrix (raw score)	4575	4.267	2.596	0	12
Raven's cognitive matrix (standardized score)	4561	0	0.999	-2.03	3.563
Digits forward (raw score)	4575	7.578	3.662	1	16
Digits forward (standardized score)	4561	0	0.999	-2.546	3.261
Digits backward (raw score)	4575	3.415	2.64	1	14
Digits backward (standardized score)	4561	0	0.999	-1.51	7.314
English test (raw score)	3457	3.71	2.727	0	7
English test (standardized score)	3444	0	0.999	-2.039	1.807
Math test (raw score)	3457	4.405	2.292	0	8
Math test (standardized score)	3444	0	0.999	-2.46	2.13
Household Variables					
Household Size	2384	5.021	2.133	2	17
Locality of residence (urban =1)	2254	0.339	0.473	0	1
Polygamous households	2384	0.069	0.253	0	1
Asset index	2381	1.242	0.799	0	2

1.10 Supplementary Analysis

1.10.1 Mother's status (PCA) and Child health and cognitive outcomes

The validity of the composite index in representing the mother's status depends on the reliability of the data aggregation technique in capturing the latent construct from the original variables. The reliability of the composite index was first examined by assessing its relationship with other indicators of women's status used in the literature in Section 1.4.9. Furthermore, to ensure that the data reduction technique does not unduly influence the results, the relationship between the mother's status and child development outcomes is reestimated using a composite index constructed using PCA. PCA and FA rely on similar techniques, although they depend on different statistical assumptions. FA tries to capture latent constructs in a set of observed variables, while PCA reduces a set of variables into fewer components without making assumptions about the underlying relationship. Composite indices using the two approaches usually yield similar results in regression analysis. The details of the PCA index construction are presented in section 1.4.8 and Appendix A. A notable distinction between the two composite indices constructed using PCA and FA is that FA captures more of the variance in the original variables than PCA. FA accounts for 98 to 100% of the common variance, while PCA accounts for 53 to 55 %.

Table 1.23 and Table 1.24 examine the relationship between the composite index using PCA and child health and cognitive outcomes, respectively. The child health outcome variables are *illness, stunting*, *underweight*, *wasting*, and *health index*; the cognitive outcomes are *English*, *math*, *digits backward*, *digits forward*, and the *cognitive index*. The RE and FE estimates are presented for each outcome variable. All estimations control for mother, child, and household characteristics. The estimations also control for time-fixed and district-fixed effects where applicable. The FE estimations do not include child gender, district, and residence locality, which are time-invariant.

Table 1.23 shows the relationship between the composite index using PCA and the different measures of child health outcomes. The RE estimates for the mother's status variable are significant at 1% for illness and the health index and 5% for stunting, while the FE estimates are only significant for illness. The coefficients of the mother's status variable in Table 1.23 are very similar in magnitude and sign to those in Table 1.10, using FA. A notable difference is the FE estimate of the mother's status on the health index, which is insignificant in **Error! Reference source not found.**.

Table 1.24 presents the regression results using child cognitive outcomes as dependent variables. The RE estimates of the mother's status are positive and significant for all cognitive outcome variables. The FE results are also positive and significant for all cognitive outcome variables except math and Raven's test. The findings in Table 1.24 are also very similar in magnitude and significance compared to Table 1.12 using FA. The only difference is that the estimates of the coefficients of the mother's status using FA are marginally larger in some cases compared to Table 1.24.

The findings in Table 1.23 and Table 1.24 corroborate the findings in Table 1.10 and Table 1.12, respectively, which provides evidence that the data aggregation technique did not influence the estimation results.

Table 1.23. Mother's status (PCA) and child health outcomes

Dependent Variables	**Illness**		**Stunting**		**Underweight**		**Wasting**		**Health Index**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Mother's status	-0.02***	-0.02**	-0.01**	-0.01	-0.00	0.00	-0.00	0.00	-0.04***	-0.03
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Female child	-0.01		-0.07***		-0.03***		-0.04***		-0.14***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.02)	
Child age	-0.01***	-0.01*	0.01***	0.11***	0.01***	0.08***	0.01***	0.06***	0.02***	0.21***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)
Mother's education	0.00	-0.00	-0.01***	-0.00	-0.00***	-0.00	-0.00**	-0.00	-0.01***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Mother's age	0.00	0.00	-0.01***	0.01	-0.01**	-0.01	-0.01***	-0.01**	-0.02***	-0.01
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)
Mother's age squared	-0.00	-0.00	0.00**	-0.00	0.00*	0.00	0.00***	0.00*	0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.00***	-0.00	0.00**	-0.01	0.01***	0.00	0.00	-0.01	0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Wealth index = Mid	0.02***	0.02*	-0.03**	-0.01	-0.01	0.01	0.00	0.01	-0.01	0.04
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.04)
Wealth index = High	0.02***	0.02	-0.05***	0.01	-0.01	0.02	-0.00	0.03	-0.04	0.06
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.03)	(0.05)
Urban	-0.02**		-0.04**		-0.06***		-0.04***		-0.16***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.03)	
District FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Dependent Variables	Illness		Stunting		Underweight		Wasting		Health Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Observations	11,814	11,814	9,873	9,874	10,368	10,368	10,739	10,739	11,825	11,825
R-squared	0.05	0.01	0.07	0.11	0.05	0.08	0.04	0.05	0.05	0.08

RE and FE are Random Effects and Fixed Effects, respectively. Stunting, Underweight, and Wasting are 1 if HAZ, WAZ, and WHZ, respectively, are below -2 SD, and 0 otherwise. Higher values of the health index denote poor health outcomes. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.24. Mother's status (PCA) and child cognitive outcomes

Dependent variables	English		Math		Digits backward		Digits forward		Raven's matrix		Cognitive Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Mother's status	0.05***	0.09*	0.04**	0.00	0.09***	0.09***	0.11***	0.11***	0.05***	0.00	0.08***	0.07***
	(0.02)	(0.05)	(0.02)	(0.04)	(0.01)	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)	(0.01)	(0.03)
Female child	-0.03	0.46**	-0.11***	0.55	-0.03	0.04	-0.06***	0.20	-0.08***	0.06	-0.07***	0.16
	(0.03)	(0.20)	(0.03)	(0.52)	(0.02)	(0.24)	(0.02)	(0.27)	(0.02)	(0.34)	(0.02)	(0.23)
Child age	-0.13***	-0.11***	-0.12***	-0.10***	-0.09***	-0.09***	-0.08***	-0.16***	-0.06***	-0.10***	-0.12***	-0.17***
	(0.01)	(0.04)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Child's education	0.18***	0.06**	0.18***	0.08***	0.16***	0.09***	0.14***	-0.02	0.10***	0.04*	0.19***	0.10***
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Mother's education	0.02***	0.01	0.02***	-0.00	0.01***	0.01	0.02***	0.03*	0.01***	0.00	0.02***	-0.00
	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)
Mother's age	0.01	-0.01	0.01	0.02	0.01	0.04*	0.01	0.01	0.01	0.04	0.02***	0.03*
	(0.01)	(0.05)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
Mother's age squared	-0.00	0.00	-0.00	-0.00	-0.00	-0.00**	-0.00	-0.00	-0.00*	-0.00	-0.00***	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.02***	-0.04	-0.01	-0.03	-0.02***	-0.04*	-0.01***	-0.02	-0.02***	0.03	-0.02***	-0.01
	(0.01)	(0.03)	(0.01)	(0.03)	(0.00)	(0.02)	(0.00)	(0.02)	(0.01)	(0.02)	(0.00)	(0.02)
Wealth index = Mid	0.08**	-0.05	0.07**	0.07	-0.02	0.08	0.01	-0.05	0.16***	0.20***	0.08***	0.08
	(0.03)	(0.10)	(0.03)	(0.09)	(0.03)	(0.06)	(0.03)	(0.07)	(0.03)	(0.07)	(0.02)	(0.06)
Wealth index = High	0.19***	0.04	0.13***	-0.01	0.06*	-0.07	0.04	-0.22***	0.20***	0.22**	0.16***	0.02
	(0.04)	(0.13)	(0.04)	(0.11)	(0.03)	(0.09)	(0.03)	(0.08)	(0.03)	(0.09)	(0.03)	(0.07)
Urban	0.35***		0.24***		0.31***		0.21***		0.13***		0.33***	

Dependent variables	English		Math		Digits backward		Digits forward		Raven's matrix		Cognitive Index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
	(0.05)		(0.04)		(0.04)		(0.04)		(0.04)		(0.03)	
District FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,153	4,154	4,597	4,598	6,653	6,653	6,700	6,700	6,714	6,714	6,593	6,593
R-squared	0.38	0.10	0.29	0.06	0.27	0.05	0.27	0.07	0.16	0.03	0.39	0.11

English, Math, Digits backward, Digits forward, and Raven's matrix are standardized scores of the respective tests. The cognitive index is from the factor analysis of the test scores. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.11 Supplementary Regression

Table 1.25. Mother's status and child nutritional outcomes

	WAZ		HAZ		WHZ	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RE	FE	RE	FE	RE	FE
Mother's status	0.14***	0.06	0.06**	0.05	0.11**	0.05
	(0.03)	(0.06)	(0.03)	(0.04)	(0.05)	(0.11)
Female child	-0.02		0.18***		-0.15**	
	(0.04)		(0.03)		(0.06)	
Child age	-0.12***	-0.60***	-0.09***	-0.58***	0.05***	-0.23**
	(0.01)	(0.08)	(0.00)	(0.04)	(0.01)	(0.10)
Mother's education	0.02***	0.08***	0.03***	0.01	-0.01	0.08
	(0.01)	(0.03)	(0.00)	(0.02)	(0.01)	(0.05)
Mother's age	0.03**	-0.02	0.05***	-0.02	0.02	0.09
	(0.01)	(0.04)	(0.01)	(0.03)	(0.02)	(0.10)
Mother's age squared	-0.00*	0.00	-0.00***	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.02**	-0.02	-0.03***	0.01	0.01	0.01
	(0.01)	(0.04)	(0.01)	(0.02)	(0.01)	(0.07)
Household wealth = 1	0.00	-0.04	0.09**	-0.02	-0.13*	-0.25
	(0.05)	(0.11)	(0.04)	(0.07)	(0.08)	(0.21)
Household wealth = 2	0.01	-0.06	0.19***	-0.02	-0.27***	-0.68**
	(0.06)	(0.15)	(0.05)	(0.09)	(0.09)	(0.29)
Urban	0.32***		0.33***		0.21*	
	(0.08)		(0.06)		(0.11)	
Constant	-0.15	2.38**	-1.42***	3.25***	-0.17	-1.78
	(0.28)	(1.15)	(0.22)	(0.78)	(0.41)	(2.03)
Observations	6,754	6,754	9,839	9,840	4,315	4,316
R-squared	0.10	0.12	0.12	0.21	0.07	0.05
District FE	Yes	NO	Yes	NO	Yes	NO
Time FE	YES	YES	YES	YES	YES	YES

WAZ is weight-for-age z-score, HAZ is weight-for-age z-score, and WHZ is weight-for-height z-score comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.26. Dimensions of mother's status and child nutritional outcomes

	WAZ		HAZ		WHZ	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RE	FE	RE	FE	RE	FE
Outcome	0.11***	0.03	0.04**	0.05*	0.09***	0.09
	(0.02)	(0.04)	(0.02)	(0.03)	(0.03)	(0.08)
Agency	0.01	0.06	0.02	-0.03	-0.01	-0.11
	(0.03)	(0.06)	(0.02)	(0.03)	(0.04)	(0.10)
Female child	-0.02		0.18***		-0.15**	
	(0.04)		(0.03)		(0.06)	
Child age	-0.12***	-0.60***	-0.09***	-0.58***	0.05***	-0.22**
	(0.01)	(0.08)	(0.00)	(0.04)	(0.01)	(0.10)
Mother's education	0.02***	0.08***	0.03***	0.01	-0.01	0.08
	(0.01)	(0.03)	(0.00)	(0.02)	(0.01)	(0.05)
Mother's age	0.03**	-0.02	0.05***	-0.02	0.02	0.08
	(0.01)	(0.04)	(0.01)	(0.03)	(0.02)	(0.10)
Mother's age squared	-0.00*	0.00	-0.00***	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.02**	-0.02	-0.03***	0.01	0.01	0.00
	(0.01)	(0.04)	(0.01)	(0.02)	(0.01)	(0.07)
Household wealth = 1	0.00	-0.04	0.09**	-0.02	-0.13*	-0.24
	(0.05)	(0.11)	(0.04)	(0.07)	(0.08)	(0.21)
Household wealth = 2	0.01	-0.06	0.19***	-0.03	-0.27***	-0.67**
	(0.06)	(0.15)	(0.05)	(0.09)	(0.09)	(0.29)
Urban	0.33***		0.33***		0.21*	
	(0.08)		(0.06)		(0.11)	
Constant	-0.16	2.68**	-1.42***	3.47***	-0.19	-1.16
	(0.28)	(1.11)	(0.22)	(0.76)	(0.41)	(1.93)
Observations	6,754	6,754	9,839	9,840	4,315	4,316
R-squared	0.10	0.12	0.12	0.21	0.07	0.05
District FE	YES	NO	YES	NO	YES	NO
Time FE	YES	YES	YES	YES	YES	YES

WAZ is weight-for-age z-score, HAZ is weight-for-age z-score, and WHZ is weight-for-height z-score comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.27. Mother's status and Child test (raw) scores

	English		Math		Digits forward		Digits backward		Raven's	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Mother's status	0.12**	0.27**	0.09**	-0.00	0.38***	0.33**	0.22***	0.30***	0.14***	0.04
	(0.05)	(0.13)	(0.04)	(0.11)	(0.06)	(0.14)	(0.04)	(0.09)	(0.04)	(0.10)
Female child	-0.08		-0.24***		-0.21***		-0.07		-0.19***	
	(0.06)		(0.05)		(0.08)		(0.05)		(0.05)	
Child age	-0.01	0.02	0.01	0.05	0.23***	-0.04	0.11***	0.13***	0.13***	0.05
	(0.02)	(0.08)	(0.02)	(0.07)	(0.02)	(0.09)	(0.01)	(0.05)	(0.01)	(0.05)
Child's education	0.43***	0.17***	0.38***	0.18***	0.48***	-0.24***	0.43***	0.27***	0.28***	0.12**
	(0.02)	(0.06)	(0.02)	(0.06)	(0.03)	(0.07)	(0.02)	(0.04)	(0.02)	(0.05)
Mother's education	0.04***	0.03	0.04***	-0.02	0.07***	0.10*	0.02**	0.03	0.03***	0.01
	(0.01)	(0.05)	(0.01)	(0.04)	(0.01)	(0.05)	(0.01)	(0.04)	(0.01)	(0.04)
Mother's age	0.03	-0.04	0.03	0.05	0.03	0.08	0.01	0.11**	0.04	0.12*
	(0.02)	(0.12)	(0.02)	(0.06)	(0.03)	(0.06)	(0.02)	(0.05)	(0.02)	(0.07)
Mother's age squared	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00***	-0.00*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.05***	-0.07	-0.02	-0.01	-0.05***	-0.03	-0.04***	-0.10**	-0.04***	0.10*
	(0.01)	(0.08)	(0.01)	(0.06)	(0.02)	(0.08)	(0.01)	(0.05)	(0.01)	(0.05)
Household wealth = 1	0.20**	-0.03	0.13*	0.11	0.05	-0.24	-0.07	0.14	0.37***	0.49***
	(0.08)	(0.23)	(0.07)	(0.18)	(0.10)	(0.24)	(0.07)	(0.15)	(0.07)	(0.17)
Household wealth = 2	0.47***	0.15	0.28***	-0.03	0.18	-0.82***	0.12	-0.12	0.49***	0.57**
	(0.09)	(0.30)	(0.07)	(0.22)	(0.12)	(0.29)	(0.08)	(0.21)	(0.08)	(0.23)
Urban	0.88***		0.48***		0.79***		0.72***		0.31***	
	(0.11)		(0.09)		(0.14)		(0.10)		(0.10)	
Constant	1.60***	3.72	2.19***	1.87	2.79***	4.37***	0.64*	-1.15	1.89***	0.52
	(0.50)	(2.66)	(0.45)	(1.53)	(0.57)	(1.66)	(0.38)	(1.22)	(0.47)	(1.62)

	English		Math		Digits forward		Digits backward		Raven's	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Observations	4,194	4,195	4,647	4,648	6,733	6,733	6,684	6,684	6,747	6,747
R-squared	0.45	0.13	0.38	0.12	0.40	0.38	0.42	0.46	0.29	0.05
District FE	Yes	NO	Yes	NO	Yes	NO	Yes	NO	Yes	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

English, Math, Digits backward, Digits forward, and Raven's matrix are raw scores of the respective tests. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1.28. Dimensions of Mother's status and child test (raw) scores

	English		Math		Digits forward		Digits backward		Raven's matrix	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Outcome	0.05	0.18*	0.06**	-0.02	0.15***	-0.05	0.11***	0.10	0.04	0.01
	(0.04)	(0.11)	(0.03)	(0.08)	(0.05)	(0.11)	(0.03)	(0.06)	(0.03)	(0.07)
Agency	0.13***	0.09	0.02	0.05	0.42***	0.67***	0.20***	0.30***	0.21***	0.05
	(0.04)	(0.12)	(0.04)	(0.09)	(0.05)	(0.11)	(0.03)	(0.07)	(0.04)	(0.08)
Female child	-0.08		-0.24***		-0.20***		-0.06		-0.18***	
	(0.06)		(0.05)		(0.08)		(0.05)		(0.05)	
Child age	-0.01	0.02	0.01	0.05	0.23***	-0.04	0.11***	0.13***	0.13***	0.05
	(0.02)	(0.08)	(0.02)	(0.07)	(0.02)	(0.08)	(0.01)	(0.05)	(0.01)	-0.05
Child's education	0.43***	0.17***	0.38***	0.18***	0.48***	-0.20***	0.42***	0.28***	0.28***	0.12**
	(0.02)	(0.06)	(0.02)	(0.06)	(0.03)	(0.07)	(0.02)	(0.04)	(0.02)	(0.05)
Mother's education	0.04***	0.03	0.04***	-0.02	0.07***	0.11**	0.02**	0.03	0.03***	0.01
	(0.01)	(0.05)	(0.01)	(0.04)	(0.01)	(0.05)	(0.01)	(0.04)	(0.01)	(0.04)
Mother's age	0.03	-0.04	0.03	0.05	0.04	0.09	0.01	0.11**	0.04	0.12*
	(0.02)	(0.12)	(0.02)	(0.06)	(0.03)	(0.06)	(0.02)	(0.05)	(0.02)	(0.07)
Mother's age squared	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00***	-0.00*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.05***	-0.07	-0.02	-0.01	-0.05***	-0.03	-0.03***	-0.10**	-0.04***	0.10*
	(0.01)	(0.08)	(0.01)	(0.06)	(0.02)	(0.07)	(0.01)	(0.05)	(0.01)	(0.05)
Household wealth = 1	0.21**	-0.03	0.13*	0.11	0.05	-0.23	-0.07	0.15	0.36***	0.49***
	(0.08)	(0.23)	(0.07)	(0.18)	(0.10)	(0.23)	(0.07)	(0.15)	(0.07)	(0.17)
Household wealth = 2	0.48***	0.15	0.28***	-0.03	0.18	-0.80***	0.12	-0.11	0.49***	0.57**
	(0.09)	(0.30)	(0.07)	(0.22)	(0.11)	(0.29)	(0.08)	(0.21)	(0.08)	(0.23)
Urban = 1	0.87***		0.48***		0.79***		0.72***		0.31***	
	(0.11)		(0.09)		(0.14)		(0.10)		(0.10)	
Constant	1.57***	3.72	2.19***	1.81	2.76***	4.03**	0.63	-1.29	1.88***	0.49
	(0.50)	(2.66)	(0.45)	(1.53)	(0.57)	(1.66)	(0.38)	(1.22)	(0.47)	(1.62)

	English		Math		Digits forward		Digits backward		Raven's matrix	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	RE	FE	RE	FE	RE	FE	RE	FE	RE	FE
Observations	4,194	4,195	4,647	4,648	6,733	6,733	6,684	6,684	6,747	6,747
R-squared	0.45	0.13	0.38	0.12	0.40	0.40	0.42	0.46	0.29	0.05
District FE	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

English, Math, Digits backward, Digits forward, and Raven's matrix are raw scores of the respective tests. The comparison category for the household wealth index is Wealth index = Low. Clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.12 Bibliography

Addo, F. R., Sassler, S., & Williams, K. (2016). Reexamining the association of maternal age and marital status at first birth with youth educational attainment. *Journal of Marriage and Family*, *78*(5), 1252-1268.

Agarwal, B. (1997). "Bargaining" and gender relations: Within and beyond the household. In *Feminist Economics* (Vol. 3). *https://doi.org/10.1080/135457097338799*

Allison, P. D. (2009). Fixed effects regression models. SAGE publications.

Alkire, S. (2008). *Concepts and measures of agency*.

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013). The women's empowerment in agriculture index. *World development*, *52*, 71-91.

Barbieri, D., Karu, M., Lestón, I. R., Mollard, B., & Reingardė, J. (2017). *Gender equality index 2017: methodological report*. Publications Office of the European Union.

Beegle, K., Frankenberg, E., & Thomas, D. (2001). Bargaining Power Within Couples and Use of Prenatal and Delivery Care in Indonesia. *Studies in Family Planning*, *32*(2), 130–146. *https://doi.org/10.1111/j.1728-4465.2001.00130.x*

Behrman, J. A. (2017). Women's land ownership and participation in decision-making about reproductive health in Malawi. *Population and Environment*, *38*(4), 327–344.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly journal of economics*, *119*(1), 249-275.

Bilker, W. B., Hansen, J. A., Brensinger, C. M., Richard, J., Gur, R. E., & Gur, R. C. (2012). Development of abbreviated nine-item forms of the Raven's standard progressive matrices test. *Assessment*, *19*(3), 354-369. Available at *https://journals.sagepub.com/doi/10.1177/1073191112446655*.

Brown, P. H. (2009). Dowry and Intrahousehold Bargaining: Evidence from China. *The Journal of Human Resources*, *44*(1), 25–46.

Chang, W., Diaz-Martin, L., Gopalan, A., Guarnieri, E., Jayachandran, S., & Walsh, C. (2020). What works to enhance women's agency: Cross-cutting lessons from experimental and quasi-experimental studies. *J-PAL Working Paper*.

Chiappori, P. A. (1992). Collective labor supply and welfare. *Journal of political Economy*, *100*(3), 437-467. Available at *https://www.jstor.org/stable/2138727*

Cornwell, C., Mustard, D. B., & Van Parys, J. (2013). Noncognitive skills and the gender disparities in test scores and teacher assessments: Evidence from primary school. *Journal of Human resources*, *48*(1), 236-264.

Desai, S., & Alva, S. (1998). Maternal education and child health: is there a strong causal relationship? *Demography*, *35*(1), 71-81.

Doss, C. (2006). The Effects of Intrahousehold Property Ownership on Expenditure Patterns in Ghana. *Journal of African Economies*, *15*(1), 149–180. *https://doi.org/10.1093/jae/eji025*

Doss, C. (1996). Women's Bargaining Power In Household Economic Decisions: Evidence From Ghana. In *Staff Papers* (No. 13517). University of Minnesota, Department of Applied Economics.

Doss, C. (2013). Intrahousehold bargaining and resource allocation in developing countries. *World Bank Research Observer*, *28*(1), 52–78. *https://doi.org/10.1093/wbro/lkt001*

Doss, C., Deere, C. D., Oduro, A. D., & Swaminathan, H. (2014). The Gender Asset and Wealth Gaps. *Development*, *57*(3-4), 400–409.

Duncan, G. J., Lee, K. T., Rosales-Rueda, M., & Kalil, A. (2018). Maternal age and child development. *Demography*, *55*(6), 2229-2255.

Dziuban, C. D., & Shirkey, E. C. (1974). When is a correlation matrix appropriate for factor analysis? Some decision rules. *Psychological bulletin*, *81*(6), 358. *https://doi.org/10.1037%2Fh0036316*

Gaddis, I., Lahoti, R., & Swaminathan, H. (2020). *Women's Legal Rights and Gender Gaps in Property Ownership in Developing Countries* [Working {{paper}}]. World Bank. *https://doi.org/10.1596/1813-9450-9444*

Geberselassie, S. B., Abebe, S. M., Melsew, Y. A., Mutuku, S. M., & Wassie, M. M. (2018). Prevalence of stunting and its associated factors among children 6-59 months of age in Libo-Kemekem district, Northwest Ethiopia; A community based cross-sectional study. *PloS one*, *13*(5), e0195361.

Hoddinott, J., & Haddad, L. (1995). DOES FEMALE INCOME SHARE INFLUENCE HOUSEHOLD EXPENDITURES? EVIDENCE FROM CÔTE D'IVOIRE. *Oxford Bulletin of Economics and Statistics*, *57*(1), 77–96. *https://doi.org/10.1111/j.1468-0084.1995.tb00028.x*

Ickowitz, A., & Mohanty, L. (2015). Why would she? Polygyny and women's welfare in Ghana. *Feminist Economics*, *21*(2), 77-104. doi 10.1080/13545701.2014.992931

OECD and Joint Research Centre-European Commission (2008). *Handbook on constructing composite indicators: methodology and user guide*. OECD publishing. Available at *https://www.oecd.org/els/soc/handbookonconstructingcompositeindicatorsmethodologyanduserguide.htm*

Kabeer, N. (2005). Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gender & Development, 13*(1), 13–24. *https://doi.org/10.1080/13552070512331332273*

Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change, 30*(3), 435–464. *https://doi.org/10.1111/1467-7660.00125*

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement, 20*(1), 141-151. *https://doi.org/10.1177%2F001316446002000116*

Kilic, T., & Moylan, H. (2016). *Methodological Experiment on Measuring Asset Ownership from a Gender Perspective*. World Bank. *https://doi.org/10.1596/33653*

Koenig, M. A., Ahmed, S., Hossain, M. B., & Khorshed Alam Mozumder, A. B. (2003). Women's status and domestic violence in rural Bangladesh: Individual- and community-level effects. *Demography, 40*(2), 269–288. *https://doi.org/10.1353/dem.2003.0014*

Kurz, D. (1993). Physical assaults by husbands: A major social problem. *Current controversies on family violence*, 88-103.

Laszlo, S., Grantham, K., Oskay, E., & Zhang, T. (2020). Grappling with the challenges of measuring women's economic empowerment in intrahousehold settings. *World Development, 132*(C).

Lavy, V., Lotti, G., & Yan, Z. (2020). Empowering Mothers and Enhancing Early Childhood Investment: Effect on Adults Outcomes and Children Cognitive and Non-Cognitive Skills. *Journal of Human Resources*, 0917–9083R2. *https://doi.org/10.3368/jhr.57.3.0917-9083r2*

Lee, G., & Ham, O. K. (2015). Factors affecting underweight and obesity among elementary school children in South Korea. *Asian nursing research, 9*(4), 298-304.

Little RJA and Rubin D.B. (2002), Statistical Analysis with Missing Data, Wiley Interscience, J. Wiley & Sons, Hoboken, New Jersey.

Niederle, M., & Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *Journal of economic perspectives, 24*(2), 129-44. doi: 10.1257/jep.24.2.129

Oduro, A. D., Boakye-Yiadom, L., & Baah-Boateng, W. (2012). Asset ownership and egalitarian decision-making among couples: Some evidence from Ghana. *The Gender Asset Gap Project, Working Paper, 14*.

OECD. (2019a). Social Institutions and Gender Index SIGI 2019 Global Report Transforming Challenges Into Opportunities. OECD.

OECD (2019b). Gender, Institutions and Development Database. OECD. Retrieved on 6 October 2022 from *https://oe.cd/ds/GIDDB2019*

Panda, P., & Agarwal, B. (2005). Marital violence, human development and women's property status in India. *World Development*, *33*(5), 823–850. *https://doi.org/10.1016/j.worlddev.2005.01.009*

Peterman, A. (2012). Widowhood and Asset Inheritance in Sub-Saharan Africa: Empirical Evidence from 15 Countries. *Development Policy Review*, *30*(5), 543–571. *https://doi.org/10.1111/j.1467-7679.2012.00588.x*

Pew Research Center (2019). Religion and living arrangements around the world. Available at *https://www.pewforum.org/wp-content/uploads/sites/7/2019/12/PF_12.12.19_religious.households.FULL_.pdf*

Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and assessing evidence for nursing practice*. Lippincott Williams & Wilkins.

Quisumbing, A. R., & de la Briere, B. (2000). Women's assets and intrahousehold allocation in rural Bangladesh. In *FCND briefs* (No. 86). International Food Policy Research Institute (IFPRI).

Quisumbing, A. R., & Maluccio, J. A. (2003). Resources at marriage and intrahousehold allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. *Oxford Bulletin of Economics and Statistics*, *65*(3), 283–327. *https://doi.org/10.1111/1468-0084.t01-1-00052*

Rakotomanana, H., Gates, G. E., Hildebrand, D., & Stoecker, B. J. (2017). Determinants of stunting in children under 5 years in Madagascar. *Maternal & child nutrition*, *13*(4), e12409.

Schultz, T. P. (1990). Testing the neoclassical model of family labor supply and fertility. *Journal of Human Resources*, 599–634.

Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L., & Martorell, R. (2003). The importance of women's status for child nutrition in developing countries. In *Research Report of the International Food Policy Research Institute*. *https://doi.org/10.1177/156482650302400309*

Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009). Report by the commission on the measurement of economic performance and social progress. *https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.215.58&rep=rep1&type=pdf*.

Strauss, J., & Thomas, D. (1995). Chapter 34 Human resources: Empirical modeling of household and family decisions. *Handbook of Development Economics*, *3*(PART A), 1883–2023. *https://doi.org/10.1016/S1573-4471(05)80006-3*

Thomas, D. (1990a). Intra-Household Resource Allocation: An Inferential Approach. *The Journal of Human Resources*, *25*(4), 635. *https://doi.org/10.2307/145670*

Thomas, D. (1990b). Intra-Household Resource Allocation: An Inferential Approach. *The Journal of Human Resources*, *25*(4), 635. *https://doi.org/10.2307/145670*

Thomas, D. (1993). The Distribution of Income and Expenditure within the Household. *Annales d'Économie Et de Statistique*, *29*, 109–135. *https://doi.org/10.2307/20075898*

Thomas, D., Contreras, D., & Frankerberg, E. (2002). Distribution of power within the household and child health. In *MPRA Paper* (No. 80075). University Library of Munich, Germany.

Thurstans, S., Opondo, C., Seal, A., Wells, J., Khara, T., Dolan, C., ... & Kerac, M. (2020). Boys are more likely to be undernourished than girls: a systematic review and meta-analysis of sex differences in undernutrition. *BMJ global health*, *5*(12), e004030. *http://dx.doi.org/10.1136/bmjgh-2020-004030*

UNICEF. (1991). Strategy for improved nutrition of children and women in developing countries. In *The Indian Journal of Pediatrics* (Vol. 58, pp. 13–24). Springer.

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *Lancet, 371*(9609), 340–357. *https://doi.org/10.1016/S0140-6736(07)61692-4*

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219-246. Available at *https://journals.sagepub.com/doi/full/10.1177/0095798418771807*

WHO (2022). Help Topic: Malnutrition in children. *Stunting, wasting and underweight*. Retrieved on October 6 2022 from *https://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=391&lang=EN*

WHO (2018). 2018 Global reference list of 100 core health indicators (plus health-related SDGs). World Health Organization. Available at *https://apps.who.int/iris/handle/10665/259951*. License: CC BY-NC-SA 3.0 IGO

WHO, UNICEF (2017). Global nutrition monitoring framework: operational guidance for tracking progress in meeting targets for 2025. Geneva: World Health Organization. Available at *http://www.who.int/nutrition/publications/operational-guidance-GNMF-indicators/en/*

Women, U. N. (2018). Why gender equality matters across all SDGs. Turning Promises into Action: Gender Equality in the 2030 agenda for sustainable development, 72. Available at *https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2018/SDG-report-Chapter-3-Why-gender-equality-matters-across-all-SDGs-2018-en.pdf*

Woods, D. L., Kishiyama, M. M., Yund, E. W., Herron, T. J., Edwards, B., Poliva, O., ... & Reed, B. (2011). Improving digit span assessment of short-term verbal memory. *Journal of clinical and experimental neuropsychology*, 33(1), 101-111. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2978794/

Zhang, J., & Chan, W. (1999). Dowry and Wife's Welfare: A Theotrical and Empirical Analysis. *Journal of Political Economy*, *107*(4), 786–808.

2 DO CASH AND IN-KIND FOOD TRANSFERS HAVE THE SAME EFFECT ON CHILDREN'S WELFARE? IDENTIFYING MECHANISMS USING DATA FROM A CLUSTER RANDOMIZED CONTROL TRIAL IN NORTHERN UGANDA.

by

Junior Abdul-Wahab

ABSTRACT

In this study, we propose a model that explains how targeted interventions to specific household members generate different welfare outcomes for children. The model highlights the fundamental role of preference differences, bargaining power, and social norms in influencing intra-household resource allocations towards child goods and, subsequently, child development outcomes. A key prediction of the model is that cash transfer to the mother shifts the balance of power in her favor, resulting in larger allocations to child goods and better child nutritional outcomes. In-kind food transfers, however, have no distortionary influence on intrahousehold power dynamics.

The model's predictions are tested using data from a randomized control trial in Uganda. The empirical findings show that women in cash-treatment households were more involved in household decisions about their children's health and education, their ability to work for income, and making large and small purchases, than women in food treatment. Moreover, children in cash-treatment households experienced better care, health, and nutritional outcomes than children in the food treatment arm. Further analysis reveals that the superior development outcome for children in the cash treatment was due to increased involvement in the mother's decision-making role.

Overall, the findings suggest that interventions to improve child development outcomes are more effective if they improve the mother's relative status in the household.

2.1 Introduction

Food and nutrition insecurity, especially in Africa, is increasing at an alarming rate, threatening progress toward achieving the Sustainable Development Goals (SDG)[3] . According to recent reports, more than half of Africa's population suffers from moderate to severe food insecurity[4]. If current trends continue, Africa will be the most undernourished region in the world by 2030 (FAO, 2019). The rise in food and nutrition insecurity in Africa is mainly attributed to conflict, drought, and extreme weather events caused by climate change (FAO, 2020). While long-term solutions are required to maintain food security on the continent, short-term measures such as social assistance programs are critical to saving the lives of the most vulnerable population, particularly children.

Child malnutrition – a direct consequence of food insecurity – is a major public health concern worldwide. Globally, malnutrition accounts for 45% of under-five child deaths, with the majority of fatalities happening in developing countries (Fenn et al., 2015). Children who survive hunger are more likely to be stunted, wasted, or underweight, which can impede their long-term development (Dewey & Begum, 2011; Grantham-McGregor et al., 2007; Kar et al., 2008). Improving child nutrition in Africa and other developing countries will considerably reduce child mortality and morbidity, allowing children to reach their full development potential. Investment in child nutrition can be considered a prerequisite for sustained human capital and socioeconomic development.

[3] SDG 2 aims to achieve zero hunger and end all forms of malnutrition by 2030

[4] Moderate food insecurity refers to a scenario in which people are uncertain about their ability to get food and have been compelled to limit the quality and/or amount of food they consume. Severe food insecurity occurs when people have likely ran out of food, experienced hunger, and, in the worst-case scenario, gone for days without eating (FAO, 2020).

There's a long-running debate among policy experts and academics about the most effective way of combating the double threat of household food insecurity and child malnutrition. These debates are part of a broader conversation about making social assistance programs more nutrition-sensitive. The recent surge in programs that offer households food and cash to combat household food insecurity and child malnutrition has reignited interest in this debate. The earliest theoretical exposition of transfer modalities and their effect on household consumption was provided by (Southworth, 1945). The Southworth hypothesis predicts that the impact of food coupons or cash of equivalent value on household expenditure should be the same if the transfer value is less than what the household typically spends on food. In general, evidence from developing countries suggests that, even for inframarginal households, cash has a greater impact on food consumption and food has a larger effect on calorie intake per capita (Gentilini, 2016). Nevertheless, such findings cannot be generalized given the possibility of confounding factors such as program design (Aker, 2017; Gentilini, 2016; Gilligan & Hidrobo, 2014).

Proponents of in-kind food transfers claim that food is more likely to be used for its intended purpose since it is relatively difficult to sell. Hence, it is more likely to improve household dietary intake and nutritional outcomes. Findings from Lentz and Barrett (2013) show that a large proportion of food transfers are indeed consumed compared to cash transfers. In-kind food transfers are also preferred when there are no local markets or during periods of severe food shortage. The appeal of cash transfer is mainly due to its fungibility and the variety of consumption options they provide households. Additionally, with advances in 'mobile money' technology in developing countries, cash transfers are now relatively cheaper and easier to administer than food transfers. The main risk with cash transfers is the possibility that the money will not be used as intended.

This study contributes to the ongoing discussion by examining the food versus cash debate from a child development perspective. The model developed in this study recognizes the vital role social norms play in intrahousehold decision-making and resource allocation in developing countries. The model predicts that interventions that shift the balance of power in the households in favor of the mother will lead to better welfare outcomes for the child[5]. Social norms largely determine this distortionary effect of different intervention modalities. For instance, food transfers to the woman may benefit the man instead if he contributes a larger share of the household food budget. This is likely in most communities where societal norms demand that a man provides for his family. On the other hand, a cash transfer to the mother is likely to benefit her directly. In a recent study highlighting the influence of such norms, Field (2021) shows that sending earnings directly into a woman's account (rather than her husband's) influences her participation in work and improves norms around gender roles.

The model's predictions on child outcomes are tested using data from a World Food Program (WFP) program in Northern Uganda. The program is ideal for testing the hypothesis since it provides food or cash of equal value to women. The results of the empirical findings mainly confirm the model's predictions. More specifically, the findings show that women in cash-treatment households were more involved in household decisions about their children's health and education, their ability to work for income, and making large and small purchases, than women in both control and food treatment. Additionally, children in cash-treatment households experienced better care, health, and nutritional outcomes. Further analysis reveals that the differential impact

[5] A large amount of empirical evidence from developing countries show that resources under mothers' control are more likely to be allocated towards expenditure that benefits children (Doss, 2013; Hoddinott & Haddad, 1995; Thomas, 1990)

of the transfer modalities on child care, health, and nutrition is mediated by women's involvement in decision-making.

The rest of the paper is structured as follows: Section 2.2 presents the conceptual framework. Section 2.3 illustrates an alternative conceptual framework and recent literature. Section 2.4 discusses the study setting, experimental design, and variable description. The estimation strategy is presented in Section 2.5. Section 2.6 presents the results and discussion. The summary and conclusion are presented in Section 2.7.

2.2 Conceptual Framework

In this section, we present a conceptual model to examine how cash and in-kind food transfers influence household demand for *child goods*[6] and its subsequent effect on child development outcomes.

Child development is considered an outcome of a two-stage game. In the first stage, the household decides, through an intrahousehold decision process, how much to allocate to various household expenditure items, including child goods. The optimal allocation to *child good* (c^*) enters the child development function in the second stage. The child development function, D_i, is denoted as a function of *child goods* $\mathbf{c}$, child-specific characteristics $\boldsymbol{\pi}$ (e.g., genetics, age, gender), and some external parameters $\boldsymbol{\rho}$ (e.g., socioeconomic status, environment).

$$D_i = d_i(\mathbf{c}^*, \boldsymbol{\pi}, \boldsymbol{\rho}) \tag{2.1}$$

In what follows, we discuss how policy interventions or shocks to individual household members can alter $\boldsymbol{c}^*$ to influence D. The parsimonious approach adopted here can be argued to be more relevant for evaluating policy options. For instance, policymakers may be more interested in knowing how different programs affect child outcomes and through which channels than in modeling the demand for child goods.

[6] Child goods refers to goods and services purchased specifically for a child's use, which may include food, medication, clothing, among other things.

2.2.1 The model

We assume a three-member household consisting of the mother m, father f, and child c. The household consumes three types of goods: private goods, *child goods*, and public goods. $\mathbf{q} = (q_1, \dots, q_j)'$ represents the vector of all *j* private goods, $\mathbf{c} = (c_1, \dots, c_k)'$ denotes the vector of all *k* *child goods*, and $\mathbf{h} = (h_1, \dots, h_l)'$ represents the vector of household public goods consumed by the household. Let $\mathbf{q}^i = (q_1^i, \dots\dots, q_j^i)$ and $\mathbf{c}^i = (c_1^i, \dots\dots, c_k^i)$ denote the vector of private and *child goods* consumed by each adult member $(i = m, f)$, respectively. $\mathbf{Q} = \mathbf{q}^m + \mathbf{q}^f + \mathbf{c}^m + \mathbf{c}^f + \mathbf{h}$ is the sum of all household consumption vectors with the associated market price vector $\mathbf{p}$. $x = \mathbf{p}'\mathbf{Q}$ is the household expenditure function.

Adult members of the household allocate their time T_i between three activities; working T_w^i, child care T_c^i, and leisure T_l^i. $T^i = T_w^i + T_c^i + T_l^i$ $(i = m, f)$. The income of each adult member comes from two sources; labor income I_w from working T_w hours in wage employment and non-labor income I_o from other sources. That is, $I^i = w^i * T_w^i + I_o^i$ $(i = m, f)$. The household total income is the sum of labor and non-labor income of the adult members, $y = (w^m * T_w^m) + (w^f * T_w^f) + I_o^m + I_o^f$.

2.2.2 The Unitary model

When household decision-making follows a unitary model, the household behaves like a single decision unit with a common preference function. The household members are assumed to pool their resources together. The household preference function is defined in terms of the different goods the family consumes, and it is assumed to be strictly increasing and continuously

differentiable in all its arguments. The household's utility maximization problem in a unitary framework is depicted as follows:

$$\max U^h = U(\mathbf{q}, \mathbf{c}, \mathbf{h})$$

subject to total household expenditures equalling total household income,

$$\mathbf{p}'\mathbf{Q} = y = (w^m * T_w^m) + (w^f * T_w^f) + I_o^m + I_o^f \tag{2.2}$$

T^i is total time endowment, T_c^i is the total time allocated to child care, and T_l^i is time allocated to leisure for each individual i. Solving the household utility maximization problem yields the equations for household demand for the three types of goods as functions of prices and total household income.

$$q_i^h = q_i(\mathbf{p}, y) \text{ for } i = 1, \dots, j$$

$$c_i^h = c_i(\mathbf{p}, y) \text{ for } i = 1, \dots, k$$

$$h_i^h = h_i(\mathbf{p}, y) \text{ for } i = 1, \dots, l \tag{2.3}$$

The income pooling hypothesis implies that the source of non-labor income does not matter for household allocations. Changes in the non-labor income of either partner have the same effect on household allocations in equation (2.3). In other words, given a change in non-labor income, the impact on household demand for goods will be the same regardless of which partner experiences the income change (i.e. $\frac{\partial {c_i}^h}{\partial I_o^m} = \frac{\partial {c_i}^h}{\partial I_o^f}$). This suggests that what matters for policy is the amount of

income the household receives, not the identity of the individual targeted by the program. Several studies have rejected the income pooling hypothesis and other theoretical restrictions of the unitary model (Alderman et al., 1995; Lundberg et al., 1997; Thomas, 1990). The unitary model is routinely rejected, especially in policy circles, due to its failure to account for intra-household inequalities in resource ownership and allocation.

2.2.3 The collective model

The collective model explicitly assumes that multi-member households consist of individuals with different preferences. A decision process over allocating household resources occurs among adult household members. Assuming that individuals have caring preferences[7], the utility function of the adult members depends not only on their private consumption and household public goods but also on the consumption of other household members. The utility function of each adult member is defined as:

$$U^i = u^i(\mathbf{q}, \mathbf{c}, \mathbf{h}) \text{ for } i = m, f \tag{2.4}$$

The individual utility function thus defined is strictly increasing, continuously differentiable, and separable in all its arguments. Individual preferences over the common arguments mostly differ; otherwise, the model collapses to a unitary model with a joint preference function. Browning and

[7] Caring preferences means individuals do not only care about their consumption but also that of other members of the household

Chiappori (1998) show that under weak assumptions of the efficiency hypothesis, a general household welfare function can be derived as a weighted average of each member's private utility function. Under these conditions, the household's optimal consumption vector is an outcome of the following maximization problem:

$$\max U^h = \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z}) u^m(\mathbf{q^m}, \mathbf{c}, \mathbf{h}) + (1 - \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})) u^f(\mathbf{q^f}, \mathbf{c}, \mathbf{h})$$

subject to

$$\mathbf{p'Q} = (w^m * T_w^m) + (w^f * T_w^f) + I_o^m + I_o^f \tag{2.5}$$

where $\mathbf{w} = (w^m, w^f)'$, $\mathbf{I} = (I_o^m, I_o^f)'$, and $\mathbf{z}$ is a vector of extra-environmental parameters (EEPs) [8]. The Pareto weights, also known as bargaining weights, $\mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})$ and $1 - \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})$ attached to each partner's private utility function, is a measure of their relative influence over household allocations. They are normalized to one such that an increase in one partner's bargaining weight reduces the bargaining position of the other. The bargaining positions are assumed to be increasing in own income and decreasing in prices. Changes in the EEPs that are favorable to either partner also improve their bargaining position. The household's optimal allocations, obtained from the optimization problem above, are functions of prices **p**, wages **w**, the non-labor income **I**, and

[8] Extra-household environmental parameters are factors that affect the bargaining position of individual members by influencing their outside options. They may include factors such as parental wealth, social networks, divorce laws, and marriage markets (McElroy, 1990)

the bargaining weights $\boldsymbol{\mu} = (\mu(.), 1 - \mu(.))'$. The household demand equations for private goods, *child goods*, and household public goods are denoted as follows:

$$q_i^h = q_i(\mathbf{p}, \mathbf{w}, \mathbf{I}, \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})) \text{ for } i = 1, \dots, j \tag{2.6}$$

$$c_i^h = c_i(\mathbf{p}, \mathbf{w}, \mathbf{I}, \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})) \text{ for } i = 1, \dots, k \tag{2.7}$$

$$h_i^h = h_i(\mathbf{p}, \mathbf{w}, \mathbf{I}, \mu(\mathbf{p}, \mathbf{w}, \mathbf{I}; \mathbf{z})) \text{ for } i = 1, \dots, l \tag{2.8}$$

The household demand equations for private and child goods above are the summations of individual demand. Both equations 2.6 and 2.7 can be decomposed into individual demand equations as follows.

$$q_i^h = {q_i}^m(\mathbf{p}, \mathbf{w}, \mathbf{I}, \mu(.)) + {q_i}^f(\mathbf{p}, \mathbf{w}, \mathbf{I}, 1 - \mu(.)) \text{ for } i = 1, \dots, j \tag{2.9}$$

$$c_i^h = {c_i}^m(\mathbf{p}, \mathbf{w}, \mathbf{I}, \mu(.)) + {c_i}^f(\mathbf{p}, \mathbf{w}, \mathbf{I}, 1 - \mu(.)) \text{ for } i = 1, \dots, k \tag{2.10}$$

In the unitary model, changes in prices and income affect household allocations through shifts in the budget constraint. In the collective model, however, there is an additional channel through changes in the household welfare function. Changes in prices, income, and EEPs that impact the bargaining weights affect the household welfare function in equation (2.5), which consequently influences household allocations in equation (2.6). Since an increase in one partner's bargaining weight reduces that of their spouse, the individual's identity within the household matters for intra-

household allocation. That is, the identity of the household member targeted by a government policy or program affects the allocation of resources within the family and the program's success.

2.2.4 Examining the effect of exogenous income shock on demand: the case of *child goods*.

The effect of a change in household demand for a given change in non-labor income is obtained by taking the partial derivatives of the demand equations with respect to I_o^m for mother and I_o^f for father. For example, in the case of child goods, the change in demand for a given change in non-labor income can be derived as:

$$\frac{dc_i{}^h}{dI_o^m}\Big|_{\text{p,w, z constant}} = \frac{\partial c_i{}^m(.)}{\partial I_o^m} + \frac{\partial c_i{}^m(.)}{\partial \mu}\frac{\partial \mu}{\partial I_o^m} + \frac{\partial c_i{}^f(.)}{\partial (1-\mu)}\frac{\partial (1-\mu)}{\partial I_o^m} \tag{2.11}$$

$$\frac{dc_i{}^h}{dI_o^f}\Big|_{\text{p,w, z constant}} = \frac{\partial c_i{}^f(.)}{\partial I_o^f} + \frac{\partial c_i{}^f(.)}{\partial (1-\mu)}\frac{\partial (1-\mu)}{\partial I_o^f} + \frac{\partial c_i{}^m(.)}{\partial \mu}\frac{\partial \mu}{\partial I_o^f} \tag{2.12}$$

Equations (2.11) and (2.12) can be decomposed into three parts. The first part is the *direct income effect*, the second is the *own bargaining effect*, and the third is the *partner's bargaining effect*. The *direct income effects* – $\frac{\partial c_i{}^m(.)}{\partial I_o^m}$ from equation (2.11) and $\frac{\partial c_i{}^f(.)}{\partial I_o^f}$ from equation (2.12) – measure changes in demand due to shifts in the household budget constraint. The demand for a normal good increases as household income levels increase. If *child goods* are considered normal goods, then the *direct income effects* should be positive (i.e., $\frac{\partial c_i{}^m(.)}{\partial I_o^m}$; $\frac{\partial c_i{}^f(.)}{\partial I_o^f} > 0$).

The *bargaining effect* – the sum of *own bargaining* and *partner's bargaining effects* – captures changes in household demand due to shifts in the household welfare function. The *own bargaining*

effects – $\frac{\partial {c_i}^m(.)}{\partial \mu}\frac{\partial \mu}{\partial I_o^m}$ from (2.11) and $\frac{\partial {c_i}^f(.)}{\partial (1-\mu)}\frac{\partial (1-\mu)}{\partial I_o^f}$ from (2.12) – measure how changes in the bargaining weight due to a change in own income affect household demand. The *partner's bargaining effect* – $\frac{\partial {c_i}^f(.)}{\partial (1-\mu)}\frac{\partial (1-\mu)}{\partial I_o^m}$ from (2.11) and $\frac{\partial {c_i}^m(.)}{\partial \mu}\frac{\partial \mu}{\partial I_o^f}$ from (2.12) – measures how a change in one partner's bargaining weight due to a change in their spouse's non-labor income affects demand. The terms $\frac{\partial {c_i}^m(.)}{\partial \mu}$ and $\frac{\partial {c_i}^f(.)}{\partial (1-\mu)}$ measure how demand responds to changes in the bargaining weight of the mother and father, holding all other variables constant. If either spouse's bargaining position improves, they will influence resource allocation away from less preferred goods and towards goods they prefer more. That is, $\frac{\partial {c_i}^m(.)}{\partial \mu}$; $\frac{\partial {c_i}^f(.)}{\partial (1-\mu)} > 0$ for goods that a spouse prefers more relative to other goods and $\frac{\partial {c_i}^m(.)}{\partial \mu}$; $\frac{\partial {c_i}^f(.)}{\partial (1-\mu)} < 0$ for goods that a spouse prefers less. Since each spouse's bargaining weight is increasing in their non-labor income, the second terms of the *own bargaining effect*s are positive (i.e $\frac{\partial (\mu)}{\partial I_o^m}; \frac{\partial (1-\mu)}{\partial I_o^f} > 0$). The *own bargaining effect* is positive for more preferred goods and negative for less preferred goods. On the other hand, since each individual's bargaining weight is decreasing in their spouse's non-labor income, i.e $\frac{\partial (\mu)}{\partial I_o^f}; \frac{\partial (1-\mu)}{\partial I_o^m} <$ 0, the *partner's bargaining effect* is negative for the partner with a strong preference for the good in question and positive for the partner with a relatively weak preference for the good. [9]

The overall effect of an exogenous income shock on household demand is determined by spouses' relative preferences for different goods. If there are notable preference differences, then an income shock to one of the spouses will increase household demand for goods they prefer more since both

[9] For example, following an increase in the mother's non-labor income, the father's bargaining weight is expected to decrease, which also implies a decrease in the demand for goods that the father strongly prefers, and vice versa.

the *direct income* and *bargaining effects* are positive. For goods they prefer less, the negative *bargaining effect* may partially offset the positive income effect and, in some cases, may even outweigh it if the recipient strongly dislikes the good in question. [10] However, when there are no differences in preferences, then $\frac{\partial c_i{}^m(.)}{\partial \mu}$; $\frac{\partial c_i{}^f(.)}{\partial (1-\mu)} = 0$ and $\frac{dc_i{}^h}{dI_o^m}|_{\text{p,w, z constant}} = \frac{\partial c_i(.)}{\partial I_o^m}$; $\frac{dc_i{}^h}{dI_o^f}|_{\text{p,w, z constant}} = \frac{\partial c_i(.)}{\partial I_o^f}$. The overall effect of an exogenous change in non-labor income is simply the income effect. Income shocks to either spouse will have the same impact on household demand. In the case of child goods, the overall effect of an income shock to the member with a stronger preference for child goods will be positive since both income and bargaining effects are positive. However, an income shock to the member with a relatively weaker preference for child goods will result in a weaker (possibly negative) bargaining effect which could offset the positive income effect.

The discussions above illustrate the fundamental role of differences in preferences and bargaining power on household resource allocation. The overall effect of an income shock on household demand depends on the identity of recipients and their relative preferences for different goods. If there are no differences in preferences, then the model collapses to the unitary model, and the recipient's identity does not matter.

The preceding discussions can be summarized as follows:

- Income shock to a household member can be decomposed into a *direct income effect* and a *bargaining effect*.

[10] Studies show that men spend a large portion of their income on alcohol and tobacco relative to women (Gaddis et al., 2018; Hoddinott & Haddad, 1995) and when women's share of household income increases, household expenditure towards alcohol and tobacco falls (Hoddinott & Haddad, 1995; Ward-Batts, 2008).

- The *direct income effect* of an income shock is positive for normal goods.
- The *bargaining effect* is determined by preference differences between spouses. The bargaining effect is positive for goods for which an individual has a relatively stronger preference. The bargaining effect is smaller for goods the individual has less preference for.
- The overall effect of an income shock on an individual is positive for goods that the individual prefers more than other goods. For less preferred goods, the overall effect depends on the relative magnitude of the *income* and *bargaining effects*. The overall effect may be negative if the individual strongly dislikes a good.
- If there are no preference differences, then there is no bargaining effect. And the overall effect is simply the income effect.

2.2.5 Discussion: Comparing the effect of cash and in-kind food transfers targeting women.

An implication of the collective model (which also serves as the foundation of the targeting literature) is that individual control over resources is essential for household allocations. In the case of a cash transfer, the recipient experiences an increase in their non-labor income relative to their partner. The income shock affects demand through the normal income effect and the bargaining effect. Since child good is assumed to be normal, the income effect is positive. Similarly, the bargaining effect is positive because mothers prefer child goods more strongly. Since both the direct income and bargaining effects are positive, the overall effect on the demand for *child goods* is positive. A large body of theoretical and empirical studies support the claim that mothers have a relatively stronger preference for *child goods* and therefore allocate more resources to them (see Akerlof & Kranton, 2000, 2010; Doss, 1996; Hoddinott & Haddad, 1995; Smith et

al., 2003; Thomas, 1990). Evidence from intrahousehold literature suggests cash income improves the status and autonomy of mothers in the household, allowing them to make timely and independent decisions regarding their children while also questioning traditional practices that may be detrimental to their children's health. Cash transfers targetting women in the household are likely to improve women's bargaining power, increase demand for *child goods*, and thus improve the nutritional status of children, all other things being equal.

Unlike cash, in-kind food transfer does not enter directly into bargaining weights and demand functions. However, the resulting surplus income it creates does. In-kind food transfers reduce household spending on food and free up funds for other purchases, resulting in a positive income shock to the household. The income shock positively affects the demand for *child goods* through the normal income effect. However, the surplus income and subsequent bargaining effect may benefit members other than the primary recipient of the transfer. This is because individuals tend to adhere to the norms associated with the social group they identify with, and deviating from them can result in disutility (Akerlof & Kranton, 2000; 2010). Since fathers have traditionally played the role of breadwinner in most societies, they are likely to have contributed more to food purchases before the transfer, and the resulting surplus may benefit them instead. Studies such as Pahl (1990) show that even in western societies, men contribute more to household food expenditure than women, although women contribute more relative to their total income. If both partners contribute to food purchases before the transfer, the surplus income may have little impact on their relative bargaining positions. In-kind transfers targeting mothers could place them in a weaker bargaining position, negatively affecting the demand for *child goods*. Based on the above, cash transfers targeting mothers are expected to have a stronger positive effect on the demand for *child goods* than an equivalent in-kind food transfer.

The following implications of the model are examined in Section 2.6 using data from a randomized control trial of a cash and food assistance program in northern Uganda:

- Cash transfers impact women's bargaining power in the household more than an equivalent in-kind food transfer.
- Cash transfers have a larger impact on demand for child goods than equivalent in-kind food transfers, which translates into better welfare outcomes for children.
- The larger impact of cash on demand for child goods and subsequent improvement in children's welfare is due to improvement in the mother's bargaining power.

2.3 Conceptual framework: Alternative approach

This section presents an alternative conceptual framework to motivate the empirical analysis of the potential paths from transfer modalities to child nutrition. The framework is a modified version of UNICEF's *Strategy for Improved Nutrition of Children and Women in Developing Countries* (UNICEF, 1991). Figure 1 depicts the framework.

In the framework, the immediate determinants of child nutrition are food intake and health status. Transfers to households affect child nutrition through two channels: directly through household food security[11] and indirectly through caregiver status. In this framework, women are the primary caregivers for children, in line with practice in most cultures around the world. Household food security affects child nutritional outcomes through child food intake. Caregiver status influences child nutrition through the child's food intake and health status, both of which are outcomes of childcare practices.

The relationship between transfers and household food security is well established in the literature and forms the basis of most humanitarian food assistance programs. In theory, both transfer modalities ought to improve household food security; however, the magnitude of the effect may differ depending on the size of the transfers. According to the Southworth model (Southworth, 1945), both modalities should have a similar influence on food expenditure for infra-marginal households, but the effect may differ for extra-marginal families. A meta-analysis of social protection programs by Hidrobo et al. (2018) shows that, on average, transfer programs offering either cash or food increase caloric intake by 8% and the value of food consumption by 13%. The

[11] Household food security is the availability of sufficient and nutritious food that meets the dietary requirements of all household members to live an active and healthy life, obtained through production, purchase, or in-kind transfer (Smith & Haddad, 2015)

evidence linking transfer modality and child food intake are limited, especially in developing countries. It is commonly assumed that improving household food security will increase food consumption for all members. In their impact evaluation of the WFP's program in Uganda, Gilligan et al. (2013) found child dietary intake was substantially higher across several food groups for cash-receiving households than food-receiving families. Also, Ahmed et al. (2009), examining four safety net programs in Bangladesh that provide various forms of cash and food assistance, found that while the programs increased household food consumption, there was no impact of participation on dietary intake for children under five years. Ahmet et al. (2009) highlight that higher household food security does not always translate into improved child food intake. It may also depend on how the transfer affects the intrahousehold distribution of food. Social assistance to households may enhance child food intake if they alter the intrahousehold allocation of food in a way that favors children.

Evidence examining the impact of social assistance programs on child nutritional outcomes in developing countries is largely inconclusive. Manley et al. (2012) examined 15 social assistance programs. They found mixed results across programs, although on average, they found a positive but insignificant effect of social assistance on child anthropometric outcomes. Studies evaluating cash assistance programs in Ethiopia, Uganda, and Kenya find no significant impact on child nutritional outcomes (Berhane et al., 2015; Merttens et al., 2013; Oxford Policy Management, 2013). Evidence from food assistance programs in SSA is also inconclusive. For instance, Quisumbing (2003) and Yamano et al. (2005) both find a positive impact of food aid programs in Ethiopia on child nutritional outcomes. However, Gelli and Tranchant (2018) find no impact of food aid on child nutritional outcomes in Mali. The findings on social assistance programs and child nutrition are not too surprising; they underscore that other complementary factors, such as

child health and household environment, are crucial in ensuring its effectiveness in improving child nutrition.

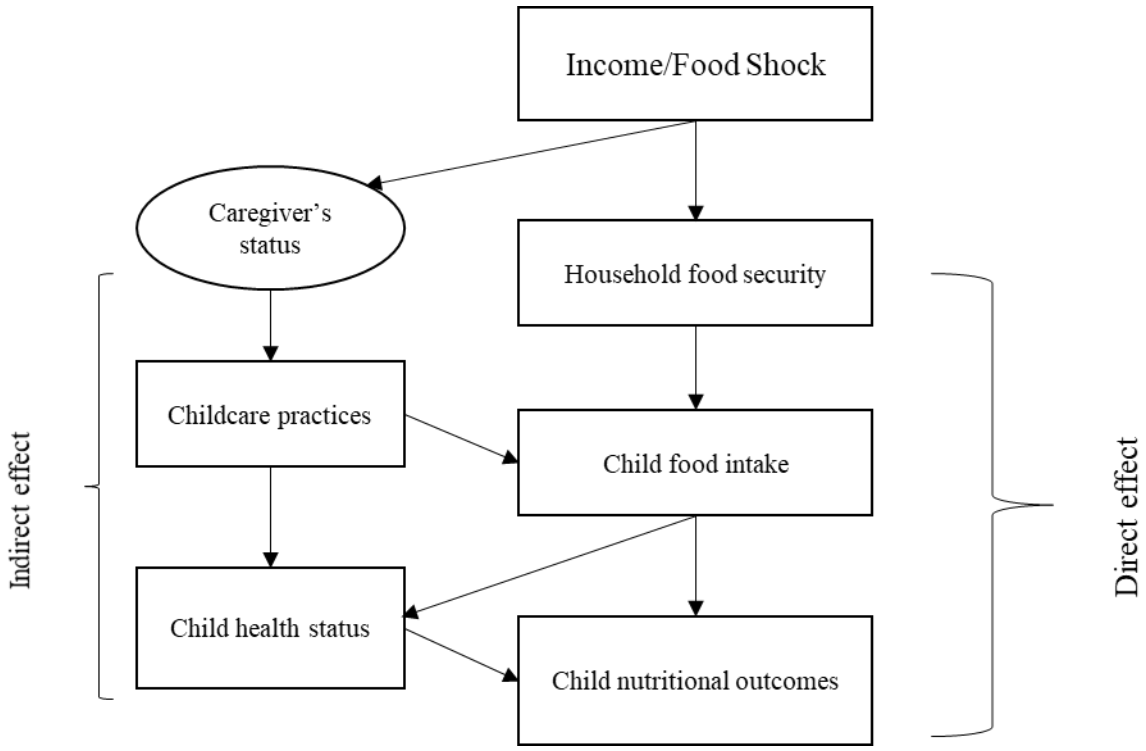


Figure 2.1. A conceptual framework linking social assistance to child nutritional outcomes.
Source: Author, modified version from Smith & Haddad (2015). Originally from UNICEF's Strategy for Improved Nutrition of Children and Women in Developing Countries (UNICEF, 1991)

A notable presence in our framework is the role of caregiver status in mediating the impact of transfer modality on various factors that affects child nutrition. Caregiver status affects child health and food intake, which are immediate determinants of nutritional status. Smith et al. (2003), for instance, provide empirical evidence linking a woman's decision-making role in the household to quality care practice and child nutritional outcomes. Other studies also show that quality care practices such as preventive healthcare, complementary feeding, breastfeeding, and cognitive

stimulation positively influence child health outcomes and cognitive development (Bustreo et al., 2015; Horta et al., 2015; Sankar et al., 2015). Thus, from the model, different transfer modalities will have different implications for all child outcomes if they affect caregiver status differently.

Evidence from intrahousehold literature suggests cash income improves the status and autonomy of mothers in the household, allowing them to make timely and independent decisions regarding childcare while also questioning traditional practices that may be detrimental to their children's health. The link between in-kind food transfers and women's status has received much less attention. A likely reason could be that, unlike income shocks, food shocks do not directly fit into mainstream models of household behavior.

However, in a society where social norms are more salient and traditional gender norms determine household responsibilities – the woman is responsible for caring for the home and children, and the man provides for the household. Food transfers could deteriorate the woman's status relative to the man because he now contributes less to the family's food budget, increasing his income relative to the woman. However, if both contribute to household food consumption before the transfer, either through purchase or production, the effect of food assistance on the woman's status will most likely be ambiguous.

Following the above discussion, cash and in-kind transfers increase the child's food intake; their subsequent impact on the child's development outcomes is, however, likely to differ. The effect on child development outcomes for cash transfers is unambiguously positive since both the direct (household food security) and indirect (caregiver/mother's status) effects reinforce each other. For food, the direct (household food security) effect on child nutritional outcomes is positive; however, the indirect effect (caregiver/mother's) status is likely to be smaller. Therefore, the impact of cash

transfers on child development outcomes will be larger than in-kind food transfers. This study hypothesizes that the difference is due to the mediating effect of the caregiver's (mother's) status.

We use data from a cluster-randomized WFP/UNICEF/IFPRI program in Northern Uganda. The program design and setting make it perfect for testing this hypothesis. The next section discusses the details of the program.

2.4 Data Source and Variables

The data for this study comes from a joint World Food Program (WFP), UNICEF, and the International Food Policy Research Institute (IFPRI) program to evaluate the cost-effectiveness of cash and food transfers on household and child food insecurity in northern Uganda[12]. We use the data from the baseline and end-line surveys conducted as part of the program. Section 2.4.1 provides a brief description of the program setting and experimental design. Section 2.4.2 describes the variables from the datasets used in this study.

2.4.1 Setting and experimental design

Uganda is a landlocked country in East Africa. The Karamoja region is located in northeastern Uganda, bordered to the east by Kenya and to the north by South Sudan. The region is considered one of the world's poorest and most food-insecure areas, with about 61 percent of its 1.4 million inhabitants living in absolute poverty (UNFP, 2018). The program offered cash or food to women in households with a child enrolled in a UNICEF-supported Early Childhood Development (ECD)[13] center in the districts of Kaabong, Kotido, and Napak.

The unit of randomization was the ECD center. The program used a stratified randomized design to ensure that all centers within each district had an equal chance of being assigned to one of the treatment arms. The centers were randomized at the district level for Napak and Kotido and the sub-district level for Kaabong. The district of Kaabong had many ECD centers, which informed the decision to divide it into two sub-districts (Dodoth East and Dodoth West). ECD centers close to each other (within 1 to 2 kilometers) were combined to minimize children transferring from one center to the other to benefit from the program. Randomization of each of the centers into the

[12] Gilligan et al. (2013) for the details of the program and final report.
[13] ECD centers are informal preschools usually funded by the community for children between ages 3 and 5.

different treatment arms was done by randomly picking colored beads in the presence of WFP and local government officials. After the endline survey, ECD centers in the control group also received the intervention.

Table 1 shows the distribution of ECD centers by district and treatment arms after the randomization. The program enrolled a total of 98 ECD centers. The 18 centers from Napaak and 9 from Kotido were equally distributed across the three groups. The centers in the two sub-districts of Kaabong were also fairly distributed among the treatment arms. In Dodoth East, 13 centers each were assigned to control and cash treatment, and 14 to food treatment. In Dodoth West, 10 centers each were assigned to control and food treatment, and 11 to cash treatment. Overall, 32 ECD centers were randomly assigned to control, 33 to food treatment, and 33 to cash treatment.

Table 2.1 Number of ECD centers in treatment and control for each district.

	Treatment arms			
District (subdistrict)	Control	Food	Cash	Total
1. Napaak	6	6	6	18
2. Kotido	3	3	3	9
3. Kaabong (Dodoth East)	13	14	13	40
4. Kaabong (Dodoth West)	10	10	11	31
Total	32	33	33	98

Source: Author using data from the baseline survey

Although the ECD center was the unit of randomization, mothers of children attending the ECD centers were the primary recipients of the transfers. For individuals in the food treatment, food was distributed by trucks to the communities and given as take-home rations. The food basket consisted of approximately 1,200 calories of highly nutritious food (including corn-soy blend, Vitamin-A fortified oil, and sugar). For individuals in the cash treatment, the cash was sent by

electronic transfer to cards issued to the child's parent. The transfer per child was UGX 25,500 (approximately USD 10.25 in 2011), the estimated amount required to purchase a basket similar to the food transfer (Gilligan et al., 2013). Transfers for both modalities were expected to be provided across seven cycles in 6-week intervals. The interventions began in April 2011 and ended in September 2012. Initially, the transfers were planned to be conditional on ECD attendance. However, that requirement was abandoned owing to some logistical challenges.

The randomized design of the program was to ensure that treatment assignment is independent of any child, household, or community characteristic. If the randomization was successful, households in different treatment arms should have the same baseline characteristics on average; so that any post-intervention change in outcomes can be ascribed to the program. Table 2.2 below shows the balance test results to assess the randomization's success. The results show no significant differences across the treatment arms for most variables. There are, however, significant differences in child age between food and cash (0.263 years). Also, the incidence of severe wasting was three percentage points higher in the control group than in the food treatment. These differences may not be systematic enough to pose a critical threat to the identification strategy. Extra precautions will, however, be taken in the empirical analysis where feasible to guarantee that the observed discrepancies do not impact the estimations. Without systematic baseline differences between the different groups, the risk of selection bias is minimal. It should be possible to attribute average differences in outcomes to the intervention.

Table 2.2. Baseline household and child characteristics

Variable	(1) Control	(2) Food	(3) Cash	(4) Control-Food	(5) Control-Cash	(6) Food-Cash
Household Head						
Female	0.134	0.099	0.119	0.035	0.015	-0.020
	(0.019)	(0.015)	(0.022)			
Years of education	2.163	1.914	2.290	0.250	-0.127	-0.377
	(0.444)	(0.352)	(0.411)			
Catholic	0.937	0.938	0.925	-0.001	0.012	0.013
	(0.017)	(0.016)	(0.028)			
Karimojong (Bokara)	0.193	0.175	0.185	0.018	0.008	-0.010
	(0.072)	(0.066)	(0.068)			
Household Characteristics						
Household size	6.895	7.000	6.801	-0.105	0.094	0.199
	(0.141)	(0.119)	(0.114)			
Children aged 0 to 5	1.818	1.887	1.808	-0.069	0.010	0.079
	(0.043)	(0.048)	(0.052)			
Children aged 6 to 14	2.155	2.161	2.151	-0.006	0.004	0.011
	(0.075)	(0.058)	(0.069)			
Dwelling condition	0.802	0.807	0.816	-0.005	-0.014	-0.009
	(0.027)	(0.027)	(0.022)			
Toilet availability	0.495	0.466	0.511	0.029	-0.016	-0.045
	(0.057)	(0.052)	(0.046)			
Water Source	0.867	0.896	0.865	-0.030	0.001	0.031
	(0.033)	(0.032)	(0.031)			
Owns land	0.169	0.165	0.170	0.004	-0.002	-0.005
	(0.014)	(0.013)	(0.016)			
Child level Characteristics						
Age years	2.603	2.755	2.492	-0.152	0.111	0.263**
	(0.094)	(0.096)	(0.083)			
Female	0.528	0.504	0.510	0.024	0.018	-0.006
	(0.015)	(0.011)	(0.014)			
Severely stunted	0.071	0.077	0.080	-0.006	-0.009	-0.003
	(0.018)	(0.012)	(0.015)			
Severely underweight	0.050	0.021	0.043	0.030**	0.007	-0.022
	(0.012)	(0.008)	(0.014)			
Severely wasted	0.015	0.016	0.022	-0.001	-0.007	-0.006
	(0.008)	(0.007)	(0.009)			

Robust Standard errors in parentheses. Significant at *10%, **5%, and ***1%. Female head (1 = female, 0 = male). Toilet availability (1 = flush/pit latrine/pan/bucket, 0 = no toilet). Water Source (borehole/well/tap = 1, stream/river = 0). Dwelling condition (1 = good, 0 =poor). Owns land (1 = household owns land, 0 = household has no land)

Source: Author using data from the baseline survey

2.4.2 Data and Variables

We use data from baseline and end-line surveys conducted as part of the WFP/UNICEF/IFPRI program[14]. The baseline and endline survey instruments consist of a household questionnaire, a child assessment questionnaire, an ECD caregiver questionnaire, and a community questionnaire. For this study, we only use the information on women's participation in decision-making in the household questionnaire and child health, child care, and child anthropometrics in the household and child assessment questionnaire. The variables are described below, along with how they are measured.

Women's participation in decision-making: This variable is a widely used proxy for women's status in the literature. A woman's involvement in decision-making is a direct outcome of her relative status. Connelly et al. (2010), for example, use participation in decisions about children's education, family planning, investments, and large purchases as a measure of women's status; Allendorf (2007) uses women's say on their health and participation in decisions about small and large purchases; and Patel et al. (2007) use say in decisions about food preparation and consumption. We use information from the survey on who has the final say on child health, child schooling, woman's health, woman's decision to work to earn, and large and small purchases. We are interested in women's participation in these decision domains, so the responses are coded as one if a woman is involved in making final decisions and 0 if she is not. Using a Principal Component Analysis, we also estimate a decision index from all the decision variables. We use

[14] The baseline and endline datasets are publicly available and can be assessed at *http://dx.doi.org/10.7910/DVN/H3SQEY* and *http://dx.doi.org/10.7910/DVN/3REX7R*

the individual decision variables and the decision index to assess women's relative status in the household.

Childcare practice: We measure this variable using the number of times children in the household eat in a day (frequency of meals), whether a child has received a vitamin A dose, and deworming in the past six months. The frequency of meals is measured at the household level and is reported separately for children younger than 10 years and older than 10. The frequency of meals is a direct measure of food adequacy. Deworming minimizes the likelihood of worm infection; the WHO recommends a yearly or biennial dosage for all children aged 1 to 12 years (WHO, 2017). Vitamin A supplementation prevents blindness and reduces morbidity and mortality in children between 6 and 59 months (Mayo-Wilson et al., 2011).

Child health: We measure this variable using blood *hemoglobin levels,* the prevalence of *worms, diarrhea,* or illness/injury in the past four weeks. The incidence of low *hemoglobin concent*ration is a risk factor for anemia, which increases mortality risk in children. Worms are the leading cause of sickness in children and are also associated with malnutrition and impaired growth (Taylor-Robinson et al., 2015). Diarrhea is a leading cause of death in children below five years globally.

Child nutritional outcomes: Child nutritional outcomes are typically measured using anthropometric information. We measure child nutritional outcomes using severe stunting and severe underweight. A child is severely stunted or underweight if their height-for-age z-score (HAZ) or weight-for-age z-score (WAZ) is below -3 standard deviations. HAZ and WAZ are measured using anthropometric information from the dataset and information from the WHO child growth standards (2006). Being underweight is a symptom of insufficient food intake and the incidence of diseases, and it increases mortality risk in children. Stunting is a result of long-term nutritional deficiency and poor health. Stunting impairs cognitive development in children, and it

is associated with poor school performance later in life (De Onis et al., 2019). Generally, children with inadequate nutrition are at greater risk of illness and mortality.

Table 2.3 shows summary statistics for the outcome measures of interest. Measures of women's status cover mothers of all children in the sample. Meals (age ≤10) and meals (age>10) are household-level variables that measure the number of times children ten and below and above ten eat in a typical month. Detailed anthropometric information is only available for children who attend ECD centers and two children between the ages of 6-54 months randomly selected from the household. Childcare practice and child health information are available for most children in the household.

Table 2.3 Summary statistics of outcome variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Woman's status (Woman makes the decision alone or jointly with husband)					
Child health	2432	0.731	0.443	0	1
Child schooling	2422	0.617	0.486	0	1
Large purchase	2043	0.46	0.498	0	1
Own health	2433	0.868	0.338	0	1
Small purchase	2426	0.81	0.392	0	1
Work to earn money	2365	0.732	0.443	0	1
Decision Index	2,445	0.000	1.9	-4.460	1.716
Childcare practice					
Meals (age>10)	2,729	2.391	0.706	1	5
Meals (age<10)	2,729	2.743	0.948	1	6
Vitamin A	5,269	0.812	0.391	0	1
Deworm	5,230	0.829	0.376	0	1
Child health					
Has *worms*	*4,010*	*0*.025	0.156	0	1
Diarrhea	4,041	0.092	0.288	0	1
Illness/Injury	4,148	0.184	0.387	0	1
Hemoglobin level	3755	11.601	1.471	1.07	23
Hemoglobin z-scores	3,732	0.000	0.982	-7.10	4.33
Child nutritional outcome					
Stunted	2597	0.208	0.406	0	1
Severely Stunted	2597	0.082	0.274	0	1
Wasted	2251	0.186	0.389	0	1

Variable	Obs	Mean	Std. Dev.	Min	Max
Severely wasted	2251	0.067	0.249	0	1
Underweight	2629	0.246	0.431	0	1
Severely underweight	2629	0.07	0.255	0	1

Data for the table is from the endline survey. 'Woman makes the decision alone or jointly with husband' is a dummy variable (1=yes, 0=no). Child health and childcare practices cover all children in the household. Child nutrition covers children who attend ECD centers and two other children randomly selected from the household. Meals (age>10) and Meals (age<10) are household-level variables. Vitamin A, Deworm, Has *worms, Diarrh*ea, and Illness/injury are dummy variables (1=yes, 0 =no) and are available for all children in the sample. Hemoglobin level measured in grams per deciliter (g/dL). Stunting, severely stunting, wasted, severely wasted, underweight, and severely underweight are dummy variables (1 =yes, 0=no).

2.5 Estimation Strategy

Based on the conceptual framework, we suggest the following equations to estimate the effect of the transfer modalities on child outcome variables and women's status and the mediating influence of women's status on child outcome variables.

$$y_{ij} = \alpha_0 + \alpha_1 food + \alpha_2 cash + \sigma stratum_j + \varepsilon_{ij} \quad (2.13)$$

$$decision_{ij} = \beta_0 + \beta_1 food + \beta_2 cash + \beta'_4 stratum_j + \varepsilon_{ij} \quad (2.14)$$

$$y_{ij} = \theta_0 + \theta_1 food + \theta_2 cash + \theta_3 food * decis_{ij} + \theta_4 cash * decis_{ij} + \theta_5 decis_{ij} + \theta'_6 strat_j + \varepsilon_{ij} \quad (2.15)$$

Where *y* is the outcome variable of the child at the endline, food and cash are treatment indicators for children in the food and cash treatment, respectively, $decision$ represents the mother's participation in household decisions at endline, $stratum$ is the stratum fixed effect, and $\varepsilon_{ij}\ represents$ the error term.

Equation (2.13) estimates the effect of treatment exposure on the outcome variables. α_1 and α_2 are the *intent to treat effects* (ITT) of food and cash on the child outcome variables. Equation (2.14) estimates the impact of the treatment on the mother's participation in household decision-making. β_1 and β_2 are the ITT of food and cash transfers on the mother's decision-making.

The parameters from equations (2.14) and (2.15) are used to decompose the treatment effect into direct (income) and indirect (bargaining) effects, following the approach proposed by VanderWeele and Valeri (2013). The method is useful for estimating a mediation effect with

treatment exposure interaction. The authors suggest the following in calculating the direct and indirect effects using the parameters from equations (2.14) and (2.15).

$$NDE_{food} = (\theta_1 + \theta_3(\beta_0 + \beta_1 food^* + \beta'_4)) \tag{2.16}$$

$$NIE_{food} = (\theta_5\beta_1 + \theta_3\beta_1 food) \tag{2.17}$$

$$NDE_{cash} = (\theta_2 + \theta_4(\beta_0 + \beta_2 cash^* + \beta'_4)) \tag{2.18}$$

$$NIE_{cash} = (\theta_5\beta_2 + \theta_4\beta_2 cash) \tag{2.19}$$

NDE is the natural direct effect, and NIE is the natural indirect effect. The natural direct effect (NDE) shows how much the outcome variable will change for individuals in a particular treatment group if, for each individual, the mediator was at the level it would have taken without the treatment. NDE corresponds to the income effect in the conceptual framework presented in section 2.2. The natural indirect effect measures the average change in the outcome variable for individuals in the treatment group, given that the mediator was changed from the level it would take without the treatment to the level it takes with the treatment. NIE corresponds to the bargaining effect from the conceptual framework. The total effect is the sum of the NIE and NDE.

Considering the randomized design of the program, we estimate all equations using a simple linear regression model in the case of continuous outcome variables and a probit regression model in the case of binary outcome variables. All models control for stratum fixed effects, and standard errors are clustered at the level of the unit of randomization.

2.6 Results and Discussion

The main estimation results assessing the effect of transfer modalities targeted at mothers on child development outcomes are presented in this section. All results in this section represent the intent-to-treat effects of the intervention (ITT). The Local Average Treatment Effects (LATE) and other robustness checks are presented in the appendix.

The section is divided into three main sub-sections. Section 2.6.1 presents the estimation results of cash and food transfers on childcare practice, child health, and child nutritional outcomes. Section 2.6.2 examines the effect of cash and food transfers on the mother's participation in decision-making and the decision index. Section 2.5.3 examines the direct (income) and indirect (bargaining) effects of food and cash on child development outcomes.

2.6.1 Transfer modality, childcare practice, and child health and nutrition outcomes.

Table 2.4 reports the ITT effect of the transfers on childcare practice, and Table 2.5 shows the results for child health and nutrition. Each column depicts an estimation of equation 1 based on a separate child outcome variable. The first two rows correspond to the food and cash ITT effect. For all binary outcome variables, the table reports the marginal effects. The probit estimation results for binary dependent variables are in the appendix. The *p-value* of the equality of the two modalities is in the last row.

Table 2.4 shows the impact of the transfers on the frequency of meals in a day for children older than ten years (*meals, age>10*), frequency of meals for children less than ten years (*meals, age≤10*), *vitamin A* dose, and *deworming* in the previous six months. The effect of food transfer on all the outcome variables is insignificant. On the other hand, children in the cash treatment consumed more daily meals and were more likely to be *dewormed* than children in the control

group. The coefficient on meals for children less than ten years and *vitamin A* dose are insignificant, although they have the expected sign. In terms of magnitude, children older than ten consumed 0.13 more meals and were 5.7 percentage points more likely to have received a *vitamin A* dosage than children in the control group. The positive effect of the cash treatment on the frequency of *meals*, *vitamin A* dose, and *deworming* indicate that the cash transfers improved children's dietary intake and the health-seeking behavior of mothers.

The *p-values* of the equality test suggest that the effects of food and cash on meal frequency for children below ten years and children above ten years and *deworming* are statistically different. The results imply that children in the food and cash treatment arms had statistically different outcomes for childcare practices.

Table 2.4 Effect of food and cash transfers on childcare practice

VARIABLES	**Meals (age>10)**	**Meals (age ≤10)**	**Vitamin**	**Deworm**
	OLS	OLS	Marginal Effect	Marginal effect
	(1)	(2)	(3)	(4)
Food	-0.036	-0.096	0.014	-0.019
	(0.064)	(0.093)	(0.029)	(0.029)
Cash	0.126*	0.082	0.046	0.057**
	(0.064)	(0.091)	(0.028)	(0.025)
Constant	2.353***	2.733***		
	(0.074)	(0.090)		
Stratum fixed effect	Yes	Yes	Yes	Yes
Observations	2,643	2,648	5,192	5,201
P-value (Cash=Food)	0.02	0.05	0.211	0.00

Columns (1) and (2) were estimated using OLS. Columns (3) and (4) report the marginal effects from a probit regression. All columns control for stratum fixed effects. Meals (age>10) is the number of meals children older than ten years eat per day in a normal month. Meals (age ≤10) is the number of meals children less than ten eat per day in a normal month. Vitamin (1 = received vitamin dose, 0 = did not). Deworm (1 = dewormed, 0= not dewormed). Standard errors clustered at the ECD level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.5 presents the ITT of food and cash on child health and nutritional outcomes. Column (1) shows the ITT effect of transfer modality on the prevalence of *diarrhea.* The estimation results indicate that *diarrhea* prevalence was 2.6 percentage points lower among children in food treatment and 4.9 percentage points lower among children in cash-treatment households compared to children in the control group. Also, children in the cash treatment had a lower prevalence of *diarrhea* than children in the food-treatment group.

Column (2) shows the ITT effect on the prevalence of *worms. The re*sults show that *worm* prevalence was 1.6 percentage points lower in the cash treatment compared to the control group. Children in the food treatment did not experience any significant decline in the prevalence of *worms compare*d to children in the control. The p-value of the equality of coefficients indicates that children in the cash treatment had a significantly lower prevalence of *worms* than those in the food treatment.

Table 2.5 Effect of food and cash transfers on child health and nutritional status

VARIABLES	**Diarrhea** Marg. Eff. (1)	**Worms** Marg. Eff. (2)	**Illness** Marg. Eff. (3)	**Hemoglobin** OLS (4)	**Stunted** Marg. Eff. (5)	**Underweight** Marg. Eff. (6)
Food	-0.026**	-0.002	-0.024	-0.106*	-0.013	-0.024
	(0.012)	(0.007)	(0.021)	(0.060)	(0.014)	(0.019)
Cash	-0.049***	-0.016***	-0.034*	0.124**	-0.002	-0.021
	(0.013)	(0.006)	(0.020)	(0.056)	(0.015)	(0.019)
Constant				-0.353***		
				(0.052)		
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,156	3,729	2,720	3,729	2,591	2,623
P-value (Cash = Food)	0.05	0.03	0.230	0.000	0.449	0.868

All columns, except column(4), report the marginal effects from a probit regression Marg. Eff is the marginal effect. Column (4) was estimated using OLS. All columns control for stratum fixed effects. Stratum FE is stratum fixed effects. Diarrhea, Worms, Illness, Stunted, and Underweight (1 = Yes, 0 = No). Stunted (underweight) if HAZ (WAZ) < -3 SD. Hemoglobin is standardized by age and gender. Standard errors clustered at the ECD level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Column (3) tells a similar story as column (2). Children in the cash treatment households were 3.4 percentage points less likely to have reported being *ill/injured* in the two weeks before the survey. Being in the food treatment had no impact on self-reported illness. In addition, the difference between food and cash is statistically significant. Column (4) presents the results for standardized *hemoglobin. The re*sults show a 0.15 standard deviation increase in blood *hemoglobin level a*mong children in cash treatment compared to control. Children in the food treatment experienced a 0.11 standard deviation decline in *hemoglobin* levels. In addition, children in the cash treatment had higher blood *hemoglobin* levels than those in the food-treatment group.

Both treatment arms had no significant effect on *stunting* and *underweight* in columns (5) and (6), although they have the expected signs. The difference between the two treatment arms was also insignificant. Given that stunting and underweight are relatively longer-term measures of health

outcomes, a likely reason could be that the duration of the program (18 months) was not long enough for such impacts to be fully detected.

2.6.2 Transfer modality and women's decision-making role

Table 2.6 depicts the effect of cash and food transfers on women's participation in six household decision-making domains. Columns (1) to (6) show the results using a different decision variable as an outcome variable. The outcome variables in columns (1) to (6) are binary, so the marginal effects are presented in the table. The outcome variable in column (7) is an index created from all decision domains using Principal Component Analysis. The last row shows the *p-value* from a test that the effect of food and cash on the outcome variable is the same.

The results from column (1) show no significant differences in participation in decisions regarding *child health* for women in food treatment compared to the control group. Women in cash treatment were 6.0 percentage points more likely to make decisions regarding *child health*. Furthermore, participation in *child health* decisions was significantly higher in cash than in food treatment.

In column (2), the results indicate that women in food treatment were 5.2 percentage points more likely to participate in decisions regarding *child schooling*, and those in cash treatment were 12.6 percentage points more likely to participate in decisions regarding *child schooling*. The difference among the treatment arms was also significant in favor of women in the cash treatment.

Column (3) shows that women in food treatment did not experience any significant change in participation in decisions about *work to earn*. In contrast, women in cash treatment experienced a 10.5 percentage point increase in participation in decisions regarding *work to earn*. The coefficient difference is also statistically significant in favor of women in the cash treatment.

For the decision variable *own health* in column (4), women in food treatment experienced a 4.0 percentage point decline in their participation in that domain compared to control. Those in cash treatment did not experience any significant change in this decision domain, although the coefficient was positive. The coefficients between food and cash treatment arms are also statistically different.

Regarding purchase decisions, women in food treatment did not experience any significant change in deciding *small* and *large purchases* compared to the control group. In contrast, women in cash treatment experienced a 7.8 and 5.0 percentage points increase in their participation in decisions regarding *large* and *small purchases*, respectively. However, the difference between food and cash treatment is significant for *small purchases*.

The result in column (7) shows that women in food treatment did not experience a significant change in the overall *decision index*. However, women in the cash treatment experienced a 0.408 standard deviation increase in the *decision index*. Furthermore, the *p-value* of the test of equality of coefficients indicates that the difference is statistically significant.

The findings in this section support the predictions of our conceptual framework. As argued, an exogenous increase in women's income will impact their decision-making role due to its tendency to distort the power structure within the household. Many studies in the bargaining literature also support these findings, arguing that income in the hands of mothers improves their bargaining power and, as a result, their decision-making role in the household. On the other hand, food transfers do not have the same 'distortionary' effects. As argued earlier, this may be because the surplus income they generate does not necessarily accrue to the transfer recipient. When individuals other than the recipient contribute more to household food purchases, the surplus income from an in-kind transfer might accrue to them.

Table 2.6 Effect of food and cash transfers on women's involvement in decision-making

VARIABLES	Child health	Child Schooling	Work to Earn	Own Health	Large Purchases	Small Purchases	Decision Index
	Marg. Eff	Marg. Eff	Marg. Eff	Marg. Eff	Marg. Eff	Marg. Eff	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food	0.007	0.052*	0.009	-0.040*	0.037	-0.020	0.041
	(0.037)	(0.028)	(0.033)	(0.023)	(0.033)	(0.030)	(0.134)
Cash	0.060*	0.126***	0.105***	0.012	0.078*	0.050**	0.408***
	(0.035)	(0.031)	(0.032)	(0.020)	(0.046)	(0.025)	(0.136)
Constant							0.167
							(0.134)
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,446	2,436	2,378	2,439	2,053	2,447	2,447
P-value (Cash = Food)	0.007	0.006	0.000	0.005	0.148	0.000	0.000

Marginal effects from a probit regression are reported in Columns (1) to (6). Column(7) is estimated using OLS. All columns control for stratum fixed effects. C*hild health*, *child schooling*, *work to earn*, own health, *large purchases,* and *small purchases* (1= mother involved in decision, 0 = mother not involved in decision). Decision Index PCA is the Index created from all decision variables using PCA. Standard errors clustered at the ECD level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

2.6.3 Transfer modality, women's status, and child welfare outcomes.

An important question we seek to answer is whether the differential impact of the transfer modalities on the child development outcomes can be explained by women's status, as depicted in the conceptual framework. The approach proposed by VanderWeele and Valeri (2013) is adopted to investigate the mechanism put forward by the conceptual models. Following the conceptual model, we expect the natural direct (income) effect to be positive for both transfer modalities; and the natural indirect (bargaining) effect to be greater for cash than for food. That is, we would expect gains in the mother's decision-making capacity in the cash treatment households to drive the higher impact of cash relative to food on children's development outcomes.

The child development outcomes are the same as in previous sections. Childcare practice is measured using *meals (>10), meals (≤10), vitamin A dose*, and *deworm*; child health is assessed using *illness, worms, diarrhea, and hemoglobin level*; and child nutritional status is measured using *severe stunting* and *severe underweight*. The decision index is used as a measure of the mother's status in the household.

Tables 7 and 8 below show the estimation results for equations 11 through 14. In both Tables, the first three columns show the natural direct effect (income effect), the natural indirect effect (bargaining effect), and the total effects of the food treatment. Columns (4) through (6) show the cash treatment's natural direct (income effect), natural indirect (bargaining effect), and total effects. The columns of interest in these tables are (2) and (5), which show changes in the outcome variable attributed to a change in the mother's decision-making role in the household.

Table 2.7 Effects of mother's decision-making role on child care practices

	Food treatment			Cash Treatment		
Variables	(1) **NDE**	(2) **NIE**	(3) **TE**	(4) **NDE**	(5) **NIE**	(6) **TE**
Meals (>10)	0.17	-0.02	0.14	0.18	0.10***	0.28**
	(0.255)	(0.28)	(0.334)	(0.201)	(0.001)	(0.052)
Meals (≤ 10)	0.07	-0.02	0.05	0.18	0.07***	0.24*
	(0.618)	(0.203)	(0.719)	(0.231)	(0.001)	(0.097)
Vitamin A	0.05	0.00	0.05	0.09***	0.00	0.09***
	(0.126)	(0.759)	(0.125)	(0.004)	(0.953)	(0.004)
Deworm	0.03	0.00	0.03	0.10***	0.01***	0.11***
	(0.448)	(0.2)	(0.485)	(0.00)	(0.00)	(0.00)

NDE is the natural direct or income effect. NIE is the natural indirect or bargaining effect. TE is the total effect, the sum of NDE and NIE. Columns (1) and (2) are estimates of equations 11 and 12, respectively. Columns (4) and (5) correspond to equations 13 and 14. Meals (age>10) is the number of meals children older than ten years eat per day in a normal month. Meals (age ≤10) is the number of meals children aged ten and below eat per day in a normal month. Vitamin (1 = received vitamin dose, 0 = did not). Deworm (1 = dewormed, 0= not dewormed). P-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7 shows the decomposition of the total effect of the intervention on childcare practices into natural direct (income) and indirect (bargaining) effects. The income effects for both modalities from columns (1) and (4) have the expected sign; however, the coefficients are only significant for *vitamin A* and *deworm* in the cash treatment group. The results in column (2) indicate that the bargaining effect in the food treatment arm has inconsistent signs and does not appear significant at any conventional level. The bargaining effect in column (5) for the cash treatment is consistently positive, and the coefficient is statistically significant at 1% for three out of four outcome variables. The results indicate that changes in the mother's decision-making role accounted for at least 35.7% of the total change in *meals (>10 years)*, 29.16% of the change in *meals (≤10)*, and 9% of the change in *deworm* in the cash treatment arm.

Table 2.8 Effects of mother's decision-making role on child health and nutritional status

	Food treatment			**Cash Treatment**		
Variables	(1) **NDE**	(2) **NIE**	(3) **TE**	(4) **NDE**	(5) **NIE**	(6) **TE**
Illness	-0.01	0.00	-0.01	-0.03**	-0.01***	-0.04***
	(0.3)	(0.285)	(0.314)	(0.013)	(0.00)	(0.003)
Worms	-0.01	0.00	-0.01	-0.03**	0.00	-0.03**
	(0.255)	(0.307)	(0.275)	(0.022)	(0.108)	(0.015)
Diarrhea	-0.08***	0.00	-0.07***	-0.08***	-0.02***	-0.09***
	(0.00)	(0.125)	(0.00)	(0.00)	(0.00)	(0.00)
Hemoglobin levels	0.05	-0.03	0.03	0.29	0.07***	0.35*
	(0.786)	(0.111)	(0.889)	(0.173)	(0.00)	(0.095)
Underweight	-0.05	0.01	-0.04	-0.03	-0.02***	-0.04
	(0.131)	(0.192)	(0.176)	(0.354)	(0.001)	(0.16)
Stunted	-0.02	0.00	-0.02	-0.01	0.00	-0.01
	(0.482)	(0.685)	(0.476)	(0.695)	(0.362)	(0.753)

NDE is the natural direct effect. NIE is the natural indirect effect due to the mother's decision-making role. TE is total effect. It is the sum of NDE and NIE. Columns (1) and (2) are estimates of equations 11 and 12, respectively. Columns (4) and (5) correspond to equations 13 and 14. Diarrhea, Worms, Illness, Stunted, and Underweight (1 = Yes, 0 = No). Stunted (underweight) if HAZ (WAZ) < -3 SD. Hemoglobin is standardized by age and gender. Column (1) and (2) corresponds to equation 11 and 12, respectively. Columns (4) and (5) corresponds to equation 13 and 14. P-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2.8 shows the decomposition of the change in child health and nutritional status into natural direct (income) and indirect (bargaining) effects. Columns (1) and (4) show that the income effect of both food and cash have the expected sign; negative for incidence of illness, worms, diarrhea, underweight, and stunting, and positive for hemoglobin levels. The coefficient is only significant for diarrhea in the food treatment and *illness*, *worms*, and *diarrhea* in the cash treatment arm. The bargaining effect in column (2) is insignificant for all outcome variables in the food treatment arm. For the cash treatment arm, the bargaining effect in column (5) has the expected sign in all rows, and it is statistically significant at 1% for four out of six outcome variables. The results indicate that change in the mother's decision-making role accounted for at least 33.33% of the overall change in *illness*, 22.22% of the change in *diarrhea*, and 20% of the total change in *hemoglobin*. Also, the bargaining effect contributed about 50% of the decline in severe *stunting*, although the total effect is statistically insignificant.

The findings in this section largely support the conceptual framework and the hypotheses we draw from it. The results show that cash transfers significantly affected the mother's decision-making role in the household, while food transfers did not. Furthermore, cash had a significantly larger effect on child development outcomes compared to food. Decomposing the total effect reveals that the difference in child development outcomes is due to the positive bargaining effect in the cash treatment. Additionally, results from the decomposition show that the income effect is more significant in the cash treatment than in the food treatment, implying cash has a more 'direct' effect on the household budget than food.

2.7 Summary and Conclusion

In this chapter, we present a conceptual framework to demonstrate how different interventions targeted at various household members generate different welfare outcomes for children. The model highlights the fundamental role of preference differences, bargaining power, and social norms in influencing intra-household resource allocations towards child goods and, subsequently, child development outcomes.

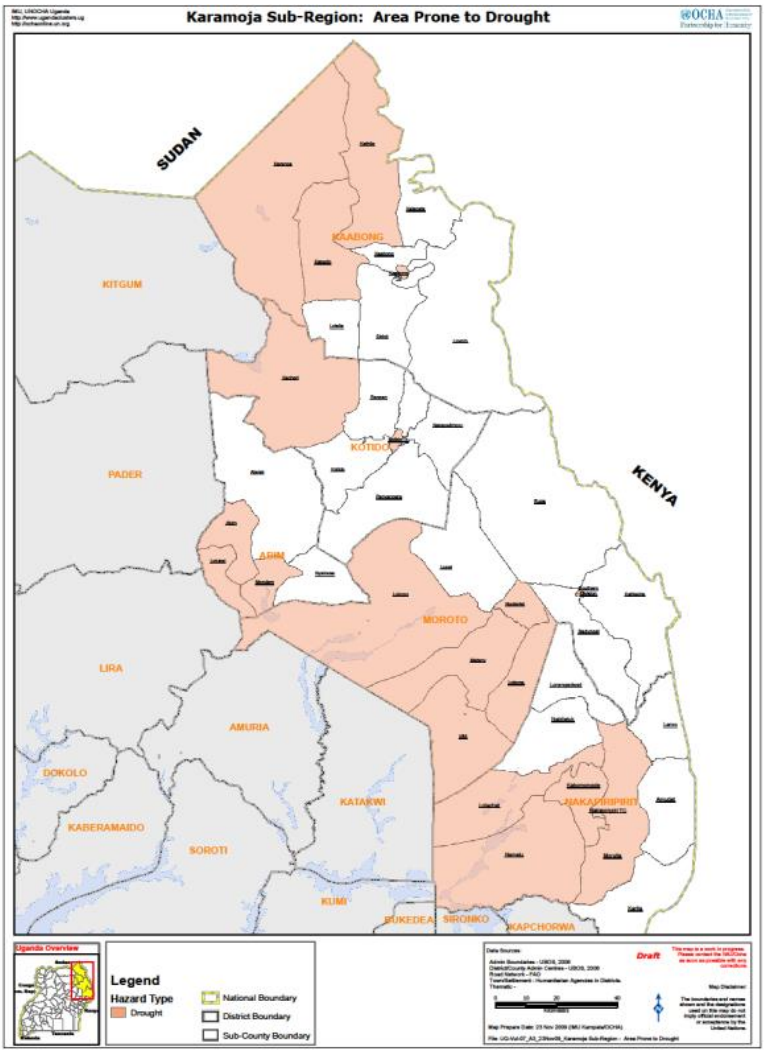
Child development is modeled as an outcome of a two-stage game. In the first stage, the household decides on the optimal allocation of child-specific goods through an intrahousehold decision process, which enters the child welfare function in the second stage. Transfer to households or policy interventions affect child outcomes by shifting the balance of power towards household members with a higher preference for child goods. The model predicts that in societies where gender norms are salient in intrahousehold relations, cash transfers to the mother shift the balance of power in her favor. In-kind food transfers, however, have no distortionary influence on intrahousehold power dynamics. Subsequently, cash transfers to the mother result in larger allocations to child goods in the first stage and better child nutritional outcomes in the second stage than in-kind food transfers.

We test the predictions using data from a randomized control trial of a WFP/UNICEF/IFRPI program in Northern Uganda to examine the relative effectiveness of food and cash transfers on household food security. The empirical findings largely corroborate the conceptual framework's predictions. The results indicate that children in the cash treatment households experienced better development outcomes than those in the food treatment arm. The difference in child development outcomes in the two groups was mainly due to improvements in the mother's status in the cash treatment arm.

For policy purposes, the findings suggest that knowledge of domestic power relations and preference differential among household members is key to identifying which individuals to target and what form of intervention is likely to be more effective. For instance, in societies where gender norms are more prominent in intrahousehold relations, cash is more effective at improving child development outcomes compared to food when targeted at women. Generally, interventions to improve children's welfare are more effective if they also improve the mother's relative status in the household.

2.8 Appendix

Figure 2.2. Map of the Karamoja region in Northern Uganda.



Source: Gilligan et al. (2013)

Table 2.9 ITT Effect: Transfer modality child care and health outcomes

Dependent variables	**Illness**	**Worms**	**Diarrhea**	**Vitamin**	**Deworm**	**Meals (age>10)**	**Meals (age≤10)**	**Hemoglobin**
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food	0.018	0.091	-0.171	-0.011	-0.218***	-0.081*	-0.115**	-0.138*
	(0.073)	(0.154)	(0.109)	(0.080)	(0.084)	(0.041)	(0.055)	(0.073)
Cash	-0.211***	-0.552**	-0.382***	0.074	0.104	0.076*	0.062	0.140**
	(0.078)	(0.220)	(0.121)	(0.083)	(0.088)	(0.042)	(0.056)	(0.071)
Child age	-0.006***	-0.004	-0.007**	-0.001	-0.001	0.001***	0.000	0.015***
	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.000)	(0.000)	(0.002)
Child sex	-0.006	-0.074	0.095	-0.012	-0.037	-0.003	0.017	0.122**
	(0.059)	(0.141)	(0.093)	(0.063)	(0.067)	(0.027)	(0.038)	(0.056)
Household size	-0.011	-0.004	0.020	-0.006	-0.004	0.016*	0.031***	0.012
	(0.016)	(0.038)	(0.024)	(0.017)	(0.018)	(0.008)	(0.012)	(0.014)
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline outcome variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control mean	-0.839***	-1.793***	-1.318***	0.743***	0.722***	2.162***	2.471***	10.224***
	(0.188)	(0.386)	(0.296)	(0.200)	(0.192)	(0.088)	(0.122)	(0.180)
Observations	2,764	1,908	2,043	2,086	2,094	2,633	2,617	2,533
P-value								
Food=Cash	0.0025	0.0035	0.083	0.2888	0.000	0.000	0.008	0.000

ITT Effects with ANCOVA and additional controls. Columns (1) to (5) were estimated using Probit, and (6) to (8) were estimated using OLS. All specifications control baseline outcome variables, child age, child sex (female =1, 0=male), household size, and stratum fixed effects. Vitamin (1=receive vitamin dose, 0=did not receive vitamin dose). Deworm (1=dewormed, 0=not dewormed). Diarrhea (1= has *diarrhea*, 0 = no *diarrhea*). Worms (1=has *worms*, *0=no w*orms). Illness/injury (1=reported ill or injured, 0 = not ill or injured). Hemoglobin level measured in grams per deciliter (g/dL). The baseline *hemoglobin variabl*e is not available. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.10. ITT effect: Transfer modality and child nutritional outcomes using Probit

Dependent variables	**Stunted**	**Severely stunted**	**Wasted**	**Severely wasted**	**Underweight**	**Severely underweight**
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Food	0.0777	-0.0697	-0.0531	-0.332**	-0.0331	-0.194*
	(0.0922)	(0.124)	(0.0983)	(0.133)	(0.0843)	(0.114)
Cash	-0.0156	-0.0492	-0.0226	-0.230*	-0.0542	-0.337***
	(0.0936)	(0.124)	(0.100)	(0.131)	(0.0851)	(0.122)
Child age	0.00371	0.00163	0.00908** *	0.000689	0.00542**	0.00663**
	(0.00304)	(0.00429)	(0.00307)	(0.000960)	(0.00239)	(0.00318)
Child sex	-0.0574	-0.0402	0.220***	0.117	-0.0452	0.0411
	(0.0751)	(0.102)	(0.0808)	(0.109)	(0.0686)	(0.0977)
Household size	0.0133	0.0106	0.00945	-0.00416	0.0222	0.0116
	(0.0191)	(0.0254)	(0.0204)	(0.0266)	(0.0175)	(0.0241)
Stratum fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Baseline outcome variable	Yes	Yes	Yes	Yes	Yes	Yes
Control mean	-1.463***	-1.773***	-1.544***	-1.092***	-1.094***	-1.786***
	(0.272)	(0.359)	(0.268)	(0.227)	(0.227)	(0.309)
Observations	1,735	1,735	1,401	1,401	1,768	1,768
P-value						
Food=Cash	0.299	0.868	0.7549	0.4642	0.7992	0.257

ITT Effects with ANCOVA and additional controls. All columns control for the baseline outcome variable, child age, child sex (female =1, 0=male), household size, and stratum fixed effects. Moderate (severe) stunting is defined as HAZ < -2 (-3). Moderate (severe) underweight is defined WAZ < -2 (-3). Moderate (severe) wasting is WHZ< -2 (-3). Standard errors clustered at the ECD level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.11. ITT effect: Transfer modality and women's decision-making

Dependent variables	**Child health**	**Child schooling**	**Work to earn**	**Own health**	**Family planning**	**Large purchase**	**Small purchase**	**Decision Index**
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food	-0.069	0.104	0.024	-0.182**	0.009	0.129	-0.117	-0.090
	(0.075)	(0.071)	(0.077)	(0.086)	(0.113)	(0.083)	(0.080)	(0.109)
Cash	0.126	0.314***	0.306***	0.008	0.048	0.202**	0.184**	0.324***
	(0.077)	(0.073)	(0.080)	(0.090)	(0.110)	(0.083)	(0.084)	(0.105)
Woman's age	0.003	0.013***	0.013**	0.002	0.009	0.003	-0.002	0.009
	(0.005)	(0.004)	(0.005)	(0.005)	(0.008)	(0.005)	(0.005)	(0.006)
Household size	-0.017	-0.026	0.021	-0.014	0.020	-0.033*	0.004	-0.022
	(0.017)	(0.016)	(0.018)	(0.020)	(0.027)	(0.019)	(0.019)	(0.024)
Woman's education	0.336***	0.273***	0.149	0.173	0.383**	0.194*	0.177	0.439***
	(0.115)	(0.104)	(0.113)	(0.132)	(0.161)	(0.115)	(0.121)	(0.134)
Female household head	0.561***	0.765***	0.437***	0.265**	0.424**	1.076***	0.573***	0.955***
	(0.101)	(0.096)	(0.102)	(0.108)	(0.201)	(0.112)	(0.112)	(0.109)
Household own land	-0.036**	0.061***	-0.018	-0.027*	-0.029**	0.103***	-0.036**	0.098***
	(0.015)	(0.014)	(0.016)	(0.016)	(0.014)	(0.017)	(0.016)	(0.024)
Stratum fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline outcome variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control mean	0.699***	-0.028	0.234	1.005***	0.865**	0.038	0.775***	4.399***
	(0.201)	(0.186)	(0.213)	(0.224)	(0.364)	(0.210)	(0.217)	(0.294)
Observations	3,965	3,938	3,671	3,968	1,730	2,827	3,931	3,968
P-value Food=Cash	0.0092	0.0032	0.004	0.0264	0.7248	0.3743	0.002	0.000

ITT Effects with ANCOVA and additional controls. Columns (1) to (7) were estimated using Probit, and (8) estimated using OLS. All columns control for the baseline outcome variable, woman's age, household size, woman's education (1=at least primary, 0=no education), female household head (1=yes, 0=no), household owns land (1=yes, 0=no), and stratum fixed effects. Standard errors clustered at the ECD level. C*hild health*, *child schooling*, *work to earn*, own health, family planning *large purchases*, and *small purchases* (1= mother involved in decision, 0 = mother not involved in decision). Average is the average of all seven decision variables. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.12. LATE: Transfer modalities and child care, nutrition, and health

PANEL A **Childcare Practice**	**Meals (>10)**	**Meals (≤10)**	**Vitamin**	**Deworm**
	(1)	(2)	(3)	(4)
Food	-0.065	-0.139**	0.024	-0.038
	(0.045)	(0.060)	(0.027)	(0.024)
Cash	0.177***	0.120*	0.075***	0.057**
	(0.048)	(0.066)	(0.029)	(0.025)
Constant	2.314***	2.699***	0.686***	0.742***
	(0.055)	(0.080)	(0.040)	(0.033)
F-stat of excl. of instrument	2203.26	2256.34	2094	2095
Observations	2,585	2,568	2,806	2,813
P-value Food=Cash	0.000	0.000	0.070	0.000
PANEL B **Child health**	**Hemoglobin**	**Illness/Injury**	**Worms**	**Diarrhea**
	(1)	(2)	(3)	(4)
Food	-0.194**	0.018	0.007	-0.024
	(0.080)	(0.021)	(0.011)	(0.017)
Cash	0.246***	-0.045**	-0.024***	-0.063***
	(0.084)	(0.022)	(0.009)	(0.017)
Constant	11.121***	0.127***	0.018**	0.064***
	(0.076)	(0.017)	(0.008)	(0.014)
F-stat of excl. of instrument	1607	1629	1751	1662
Observations	3,738	4,128	1,968	2,129
P-value Food=Cash	0.000	0.004	0.001	0.012

PANEL C **Child Nutrition**	**Stunted**	**Severely Stunted**	**Wasted**	**Severely Wasted**	**Underweight**	**Severely Underweight**
	(1)	(2)	(3)	(4)	(5)	(6)
Food	0.022	-0.011	-0.017	-0.056***	-0.012	-0.029
	(0.027)	(0.017)	(0.031)	(0.021)	(0.030)	(0.019)
Cash	-0.005	-0.010	-0.004	-0.040*	-0.018	-0.052***
	(0.029)	(0.018)	(0.034)	(0.023)	(0.033)	(0.020)
Constant	0.127***	0.056***	0.236***	0.147***	0.281***	0.108***
	(0.025)	(0.015)	(0.030)	(0.023)	(0.029)	(0.019)
F-stat of excl. of instruments	1674	1674	1472	1464	1705	1706
Observations	1,731	1,731	1,411	1,411	1,764	1,764
P-value Food=Cash	0.350	0.951	0.710	0.436	0.853	0.195

All specifications control for the baseline outcome variable, and stratum fixed effects. Vitamin (1=receive vitamin dose, 0=did not receive vitamin dose). Deworm (1=dewormed, 0=not dewormed). Diarrhea (1= has *diarrhea*, 0 = no *diarrhea*). Worms (1=has *worms*, *0=no w*orms). Illness/injury (1=reported ill or injured, 0 = not ill or injured). Hemoglobin level measured in grams per deciliter (g/dL). The baseline *hemoglobin variabl*e is not available. Moderate (severe) stunting is defined as HAZ < -2 (-3). Moderate (severe) underweight is defined WAZ < -2 (-3). Moderate (severe) wasting is WHZ< -2 (-3).

Table 2.13. LATE: Transfer modality and women's decision-making role

Dependent variables	**Child Health**	**Child Schooling**	**Work to Earn**	**Own Health**	**Family Planning**	**Large Purchase**	**Small Purchase**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Food	-0.013	0.067**	0.014	-0.062***	0.003	0.041	-0.039
	(0.029)	(0.032)	(0.031)	(0.022)	(0.046)	(0.039)	(0.026)
Cash	0.075**	0.171***	0.150***	0.006	-0.010	0.108**	0.072***
	(0.031)	(0.035)	(0.032)	(0.023)	(0.051)	(0.043)	(0.027)
Constant	0.747***	0.592***	0.772***	0.862***	0.927***	0.475***	0.773***
	(0.031)	(0.033)	(0.033)	(0.025)	(0.053)	(0.038)	(0.031)
F-stat of exclusion of instrument	1998.76	1990.93	1829.68	2011.68	794	1379.81	1993.96
Observations	2,494	2,471	2,310	2,496	1,078	1,784	2,469
P-value: Food=Cash	0.0054	0.0029	0.0000	0.0060	0.8004	0.1310	0.0000

C*hild health*, *child schooling*, *work to earn*, own health, family planning *large purchases*, and *small purchases* (1= mother involved in the decision, 0 = mother not involved). Standard errors clustered at the ECD level. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.14 Transfer modality, mother's decision-making role, and child health and nutritional outcomes

Dependent variables	Illness	Worms	Diarrhea	Hemoglobin	Underweight	Wasted
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Child Health						
Food#ChildHealth	-0.007	0.012	-0.278**	-0.127*	-0.123	-0.322**
	(0.042)	(0.177)	(0.121)	(0.077)	(0.138)	(0.160)
Cash#Childhealth	-0.150***	-0.517**	-0.535***	0.189***	-0.329**	-0.331**
	(0.042)	(0.236)	(0.133)	(0.070)	(0.146)	(0.154)
ChildHealth	0.129***	0.229	0.225*	0.063	0.096	0.222
	(0.042)	(0.208)	(0.121)	(0.076)	(0.139)	(0.155)
Panel B: Child Schooling						
Food#ChildSchooling	0.024	-0.017	-0.175	-0.148*	-0.074	-0.614***
	(0.047)	(0.190)	(0.132)	(0.086)	(0.159)	(0.186)
Cash#ChildSchooling	-0.147***	-0.537**	-0.584***	0.232***	-0.326*	-0.476***
	(0.047)	(0.246)	(0.154)	(0.077)	(0.167)	(0.167)
ChildSchooling	0.109**	0.345*	0.179	0.082	-0.049	0.285*
	(0.043)	(0.193)	(0.120)	(0.074)	(0.139)	(0.146)
Panel C: Large Purchase						
Food#LargePurchase	0.056	-0.170	-0.137	-0.166	-0.288	-0.368*
	(0.059)	(0.233)	(0.166)	(0.112)	(0.203)	(0.220)
Cash#LargePurchase	-0.133**	-0.685**	-0.680***	0.265***	-0.331*	-0.495**
	(0.056)	(0.300)	(0.202)	(0.099)	(0.201)	(0.215)
LargePurchase	0.155***	0.564***	0.280**	0.114	0.063	0.260
	(0.049)	(0.201)	(0.136)	(0.086)	(0.152)	(0.166)
Panel D: Own Health						
Food#Ownhealth	-0.000	0.031	-0.222**	-0.103	-0.137	-0.314**
	(0.039)	(0.180)	(0.112)	(0.069)	(0.127)	(0.145)
Cash#Ownhealth	-0.131***	-0.451*	-0.486***	0.158**	-0.318**	-0.302**
	(0.039)	(0.236)	(0.125)	(0.066)	(0.133)	(0.140)
OwnHealth	0.078	-0.254	0.070	0.095	0.283	0.462**
	(0.049)	(0.206)	(0.136)	(0.094)	(0.176)	(0.202)
Panel E: Small Purchase						
Food#SmallPurchase	0.016	0.087	-0.199*	-0.178**	-0.143	-0.313**
	(0.039)	(0.172)	(0.114)	(0.072)	(0.130)	(0.156)
Cash#SmallPurchase	-0.129***	-0.417*	-0.446***	0.162**	-0.323**	-0.246*

Dependent variables	Illness	Worms	Diarrhea	Hemoglobin	Underweight	Wasted
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	(0.039)	(0.216)	(0.124)	(0.065)	(0.135)	(0.145)
SmallPurchase	0.126***	0.378	0.226*	0.055	0.410**	0.363**
	(0.047)	(0.245)	(0.135)	(0.080)	(0.161)	(0.167)
Panel F: Work to Earn						
Food#WorkToEarn	0.070	0.129	-0.170	-0.140*	-0.029	-0.364**
	(0.044)	(0.198)	(0.127)	(0.083)	(0.140)	(0.161)
Cash#WorkToEear n	-0.122***	-0.385	-0.660***	0.175**	-0.231	-0.278*
	(0.043)	(0.246)	(0.151)	(0.075)	(0.142)	(0.148)
WorkToEarn	0.069	-0.036	0.073	-0.008	0.199	0.512***
	(0.045)	(0.205)	(0.121)	(0.074)	(0.150)	(0.170)
Panel G: Decision Index						
Food#Decision Index	0.005	0.006	-0.039*	-0.028**	-0.016	-0.068**
	(0.007)	(0.031)	(0.021)	(0.013)	(0.023)	(0.028)
Cash#Decision Index	-0.025***	-0.082**	-0.102***	0.031**	-0.055**	-0.057**
	(0.007)	(0.042)	(0.024)	(0.012)	(0.025)	(0.026)
Decision Index	0.028***	0.047	0.028	0.028*	0.031	0.065**
	(0.009)	(0.045)	(0.025)	(0.016)	(0.027)	(0.031)

Estimations of equaiton (10). Each panel-column grid corresponds to a different specification, with a separate child development indicator as the dependent variable and a decision variable as the independent variable. Columns (1) to (7) were estimated using Probit and (8) to (10) using OLS. All specifications control for the baseline outcome variable, levels of decision variable, woman's age, woman's education, gender of household head, household ownership of land, and stratum fixed effects. Diarrhea (1= has diarrhea, 0 = no diarrhea). Worms (1=has worms, 0 = no worms). Illness/injury (1=reported ill or injured, 0 = not ill or injured). Vitamin (1=receive vitamin dose, 0 = did not receive vitamin dose). Deworm (1 = dewormed, 0= not dewormed). Hemoglobin level measured in grams per deciliter (g/dL). The baseline hemoglobin variable is not available. Moderate (severe) stunting is defined as HAZ < -2 (-3). Moderate (severe) underweight is defined WAZ < -2 (-3). Child health, child schooling, work to earn, own health, large purchases, and small purchases (1= mother involved in a decision, 0 = mother not involved). Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 2.15 Transfer modality, mother's decision-making role, and child care practices

Dependent variables	**Vitamin**	**Deworm**	**Meals (age>10)**	**Meals (age≤10)**
VARIABLES	(1)	(2)	(3)	(4)
Panel A: Child Health				
Food#ChildHealth	0.028	-0.169*	-0.102**	-0.093*
	(0.089)	(0.093)	(0.045)	(0.056)
Cash#Childhealth	0.104	0.211**	0.060	0.117**
	(0.089)	(0.096)	(0.045)	(0.059)
ChildHealth	-0.653***	-0.526***	-0.020	-0.189***
	(0.103)	(0.107)	(0.046)	(0.060)
Panel B: Child Schooling				
Food#ChildSchooling	0.010	-0.049	-0.146***	-0.111*
	(0.099)	(0.102)	(0.049)	(0.061)
Cash#ChildSchooling	0.109	0.240**	0.047	0.117*
	(0.098)	(0.103)	(0.049)	(0.063)
ChildSchooling	-0.504***	-0.465***	0.058	-0.050
	(0.095)	(0.099)	(0.045)	(0.057)
Panel C: Large Purchase				
Food#LargePurchase	-0.294**	-0.089	-0.128**	-0.140*
	(0.128)	(0.128)	(0.064)	(0.078)
Cash#LargePurchase	0.031	0.178	0.113*	0.092
	(0.127)	(0.126)	(0.061)	(0.075)
LargePurchase	-0.096	-0.327***	0.063	-0.068
	(0.109)	(0.107)	(0.052)	(0.067)
Panel D: Own Health				
Food#Ownhealth	0.027	-0.197**	-0.101**	-0.125**
	(0.084)	(0.087)	(0.042)	(0.055)
Cash#Ownhealth	0.121	0.176*	0.060	0.086
	(0.084)	(0.091)	(0.042)	(0.058)
OwnHealth	-0.461***	-0.268**	0.052	-0.090
	(0.120)	(0.125)	(0.051)	(0.064)
Panel E: Small Purchase				
Food#SmallPurchase	0.026	-0.179**	-0.083*	-0.129**
	(0.086)	(0.090)	(0.043)	(0.055)
Cash#SmallPurchase	0.139	0.196**	0.067	0.109*
	(0.086)	(0.093)	(0.042)	(0.058)
SmallPurchase	-0.628***	-0.443***	0.207***	0.145**
	(0.111)	(0.112)	(0.051)	(0.067)
Panel F: Work to Earn				
Food#WorkToEarn	-0.017	-0.096	-0.084*	-0.035
	(0.093)	(0.097)	(0.048)	(0.057)

Dependent variables	Vitamin	Deworm	Meals (age>10)	Meals (age≤10)
VARIABLES	(1)	(2)	(3)	(4)
Cash#WorkToEearn	0.024	0.152	0.094**	0.177***
	(0.092)	(0.098)	(0.045)	(0.057)
WorkToEarn	-0.434***	-0.322***	0.037	-0.189***
	(0.103)	(0.104)	(0.046)	(0.061)
Panel G: Decision Index				
Food#Decision Index	-0.003	-0.028*	-0.019**	-0.019**
	(0.016)	(0.016)	(0.008)	(0.010)
Cash#Decision Index	0.019	0.037**	0.012	0.021**
	(0.015)	(0.016)	(0.008)	(0.010)
Decision Index	-0.151***	-0.145***	0.019**	-0.023**
	(0.020)	(0.023)	(0.009)	(0.012)

Estimations of equaiton (10). Each panel-column grid corresponds to a different specification, with a separate child development indicator as the dependent variable and a decision variable as the independent variable. Columns (1) to (7) were estimated using Probit and (8) to (10) using OLS. All specifications control for the baseline outcome variable, levels of decision variable, woman's age, woman's education, gender of household head, household ownership of land, and stratum fixed effects. Diarrhea (1= has diarrhea, 0 = no diarrhea). Worms (1=has worms, 0 = no worms). Illness/injury (1=reported ill or injured, 0 = not ill or injured). Vitamin (1=receive vitamin dose, 0 = did not receive vitamin dose). Deworm (1 = dewormed, 0= not dewormed). Hemoglobin level measured in grams per deciliter (g/dL). The baseline hemoglobin variable is not available. Moderate (severe) stunting is defined as HAZ < -2 (-3). Moderate (severe) underweight is defined WAZ < -2 (-3). Child health, child schooling, work to earn, own health, large purchases, and small purchases (1= mother involved in a decision, 0 = mother not involved). Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

2.9 Bibliography

Ahmed, A., Quisumbing, A., Nasreen, M., Hoddinott, J., & Bryan, E. (2009). Which kinds of social safety net transfers work best for the ultra-poor in Bangladesh? In *Operation and impacts of the Transfer Modality Research Initiative, IFPRI*.

Aker, J. C. (2017). Comparing cash and voucher transfers in a humanitarian context: Evidence from the Democratic Republic of Congo. *World Bank Economic Review*, *31*(1), 44–70. https://doi.org/10.1093/wber/lhv055

Allendorf, K. (2007). Do women's land rights promote empowerment and child health in Nepal? *World Development*, *35*(11), 1975–1988.

Atchison, C. J., Cresswell, J. A., Kapiga, S., Nsanya, M. K., Crawford, E. E., Mussa, M., Bottomley, C., Hargreaves, J. R., & Doyle, A. M. (2019). Sexuality, fertility, and family planning characteristics of married women aged 15 to 19 years in Ethiopia, Nigeria, and Tanzania: A comparative analysis of cross-sectional data. *Reproductive Health*, *16*(1). https://doi.org/10.1186/S12978-019-0666-0

Berhane, G., Devereux, S., Hoddinott, J., Hoel, J., Roelen, K., Abay, K., Kimmel, M., Ledlie, N., & Woldu, T. (2015). *Evaluation of the Social Cash Transfer Pilot Programme, Tigray Region, Ethiopia Evaluation of the Social Cash Transfer Pilot Programme, Tigray Region, Ethiopia Endline Report*. https://www.researchgate.net/publication/323134920

Breunig, R., Dasgunta, I., Gundersen, C., & Pattanaik, P. (2001). Explaining the Food Stamp Cash-Out Puzzle. *Food and Rural Economics Division, Economic Research Service, US Department of Agriculture.*, *61*(12), 1–2.

Bruhn, M., & Mckenzie, D. (2009). In Pursuit of Balance: Randomization in Practice in Development Field Experiments †. *American Economic Journal: Applied Economics*, *1*(4), 200–232. https://doi.org/10.1257/app.1.4.200

Bustreo, F., Okwo-Bele, J. M., & Kamara, L. (2015). World Health Organization perspectives on the contribution of the Global Alliance for Vaccines and Immunization on reducing child mortality. *Archives of Disease in Childhood*, *100*(Suppl 1), S34–S37. https://doi.org/10.1136/archdischild-2013-305693

Connelly, R., Roberts, K., & Zheng, Z. (2010). The impact of circular migration on the position of married women in rural China. *Feminist Economics*, *16*(1), 3–41.

De Onis, M., Borghi, E., Arimond, M., Webb, P., Croft, T., Saha, K., De-Regil, L. M., Thuita, F., Heidkamp, R., Krasevec, J., Hayashi, C., & Flores-Ayala, R. (2019). Prevalence thresholds for wasting, overweight, and stunting in children under 5 years. *Public Health Nutrition*, *22*(1), 175–179. https://doi.org/10.1017/S1368980018002434

Dewey, K. G., & Begum, K. (2011). Long-term consequences of stunting in early life. *Maternal & Child Nutrition*, *7*(SUPPL. 3), 5–18. https://doi.org/10.1111/J.1740-8709.2011.00349.X

Doss, C. (2013). Intrahousehold bargaining and resource allocation in developing countries. *World Bank Research Observer*, *28*(1), 52–78. https://doi.org/10.1093/wbro/lkt001

FAO. (2019). Food Security and Nutrition in the World. In *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*. https://doi.org/10.1109/JSTARS.2014.2300145

Fenn, B., Sangrasi, G. M., Puett, C., Trenouth, L., & Pietzsch, S. (2015). The REFANI Pakistan study - A cluster randomized controlled trial of the effectiveness and cost-effectiveness of cash-based transfer programs on child nutrition status: Study protocol. *BMC Public Health*, *15*(1), 2015–2016. https://doi.org/10.1186/s12889-015-2380-3

Field, E., Pande, R., Rigol, N., Schaner, S., & Troyer Moore, C. (2021). On her own account: How strengthening women's financial control impacts labor supply and gender norms. *American Economic Review*, *111*(7), 2342-75.

Gelli, A., & Tranchant, J.-P. (2018). The impact of humanitarian food assistance on household food security during conflict in Mali. *Boosting Growth to End Hunger By, 2025*, 71–92.

Gentilini, U. (2016). Revisiting the "cash versus food" debate: New evidence for an old puzzle? *World Bank Research Observer*, *31*(1), 135–167. https://doi.org/10.1093/wbro/lkv012

Gilligan, D., & Hidrobo, M. (2014). Much ado about modalities: Multicountry experiments on the effects of cash and food transfers on consumption patterns. *Agriculture & Applied Economics Association's 2014 Annual Meeting*. http://ageconsearch.umn.edu/bitstream/171159/2/Transfer modalities and consumption 5 29 14--AAEA.pdf

Gilligan, D., Margolies, A., Quinones, E., Shalini, R., & IFPRI. (2013). *Impact Evaluation of Cash and Food Transfers at Early Childhood Development Centers in Karamoja, Uganda*.

Grantham-McGregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., & Strupp, B. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet*, *369*(9555), 60–70. https://doi.org/10.1016/S0140-6736(07)60032-4

Hidrobo, M., Hoddinott, J., Kumar, N., & Olivier, M. (2018). Social Protection, Food Security, and Asset Formation. *World Development*, *101*, 88–103. https://doi.org/10.1016/J.WORLDDEV.2017.08.014

Hoddinott, J., & Haddad, L. (1995). DOES FEMALE INCOME SHARE INFLUENCE HOUSEHOLD EXPENDITURES? EVIDENCE FROM CÔTE D'IVOIRE. *Oxford Bulletin of Economics and Statistics*, *57*(1), 77–96. https://doi.org/10.1111/j.1468-0084.1995.tb00028.x

Horta, B. L., Loret De Mola, C., & Victora, C. G. (2015). Breastfeeding and intelligence: A systematic review and meta-analysis. In *Acta Paediatrica, International Journal of Paediatrics* (Vol. 104, pp. 14–19). Blackwell Publishing Ltd. https://doi.org/10.1111/apa.13139

IFPRI, UNICEF, and WFP (2016). Impact Evaluation of Cash and Food Transfers at Early Childhood Development Centers in Karamoja, Uganda: Baseline Survey. Harvard Dataverse. *http://dx.doi.org/10.7910/DVN/H3SQEY*

_____(2016). Impact Evaluation of Cash and Food Transfers at Early Childhood Development Centers in Karamoja, Uganda: Endline Survey. Harvard Dataverse. *http://dx.doi.org/10.7910/DVN/3REX7R*

Jain, A., Ismail, H., Tobey, E., & Erulkar, A. (2019). Stigma as a barrier to family planning use among married youth in Ethiopia. *Journal of Biosocial Science*, *51*(4), 505–519. https://doi.org/10.1017/S0021932018000305

Kar, B. R., Rao, S. L., & Chandramouli, B. A. (2008). Cognitive development in children with chronic protein energy malnutrition. *Behavioral and Brain Functions 2008 4:1*, *4*(1), 1–12. https://doi.org/10.1186/1744-9081-4-31

Lentz, E. C., & Barrett, C. B. (2013). *The economics and nutritional impacts of food assistance policies and programs*. www.fao.org/economic/esa

Manley, J., Gitter, S., & Slavchevska, V. (2012). How Effective are Cash Transfer Programmes at Improving Nutritional Status? A Rapid Evidence Assessment of Programmes' Effects on Anthropometric Outcomes. *EPPI-Centre, Social Science Research Unit, Institute of Education, University of London, July*, 94. http://eppi.ioe.ac.uk

Mayo-Wilson, E., Imdad, A., Herzer, K., Yakoob, M. Y., & Bhutta, Z. A. (2011). Vitamin A supplements for preventing mortality, illness, and blindness in children aged under 5: systematic review and meta-analysis. *BMJ*, *343*(7822). https://doi.org/10.1136/BMJ.D5094

McKenzie, D. (2012). Beyond baseline and follow-up: The case for more T in experiments. *Journal of Development Economics*, *99*(2), 210–221. https://doi.org/10.1016/j.jdeveco.2012.01.002

Merttens, F., Hurrell, A., Marzi, M., Attah, R., Farhat, M., Kardan, A., Macauslan, I., & Attah, R. (2013). *Kenya Hunger Safety Net Programme Monitoring and Evaluation Component*. www.opml.co.uk

Oxford Policy Management. (2013). *EVALUATION OF THE UGANDA SOCIAL ASSISTANCE GRANTS FOR EMPOWERMENT (SAGE) PROGRAMME Extract from the Impact Evaluation Baseline Report August 2013 – Executive Summary*. *August*, 1–8. www.opml.co.uk

Patel, A., Leonard, W., Reyes-García, V., McDade, T., Huanca, T., Tanner, S., & Vadez, V. (2007). Parental preference, bargaining power, and child nutritional status: Evidence from the Bolivian Amazon. *Tsimane'Amazonian Panel Study Working Paper*, *31*, 1–34.

Quisumbing, A. R. (2003). Food Aid and Child Nutrition in Rural Ethiopia. *World Development*, *31*(7), 1309–1324. https://doi.org/10.1016/S0305-750X(03)00067-6

Sankar, M. J., Sinha, B., Chowdhury, R., Bhandari, N., Taneja, S., Martines, J., & Bahl, R. (2015). Optimal breastfeeding practices and infant and child mortality: A systematic review and meta-analysis. In *Acta Paediatrica, International Journal of Paediatrics* (Vol. 104, pp. 3–13). Blackwell Publishing Ltd. https://doi.org/10.1111/apa.13147

Smith, L. C., & Haddad, L. (2015). How Potent Is Economic Growth in Reducing Undernutrition? What Are the Pathways of Impact? New Cross-Country evidence*. *Https://Doi.Org/10.1086/345313*, *51*(1), 55–76. https://doi.org/10.1086/345313

Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L., & Martorell, R. (2003). The importance of women's status for child nutrition in developing countries. In *Research Report of the International Food Policy Research Institute* (Issue 131). https://doi.org/10.1177/156482650302400309

Southworth, H. M. (1945). The Economics of Public Measures to Subsidize Food Consumption. *Journal of Farm Economics*, *27*(1), 38. https://doi.org/10.2307/1232262

Taylor-Robinson, D. C., Maayan, N., Soares-Weiser, K., Donegan, S., & Garner, P. (2015). Deworming drugs for soil-transmitted intestinal *worms in chil*dren: Effects on nutritional indicators, haemoglobin, and school performance. *Cochrane Database of Systematic Reviews*, *2015*(7). https://doi.org/10.1002/14651858.CD000371.PUB6

Thomas, D. (1990). Intra-Household Resource Allocation: An Inferential Approach. *The Journal of Human Resources*, *25*(4), 635. https://doi.org/10.2307/145670

UNFPA. (2018). Leaving no one behind in Karamoja. Issue Brief 07. Kampala. Available at *https://uganda.unfpa.org/sites/default/files/pub-pdf/Issue%20Brief%207.%20Leaving%20no%20one%20behind%20in%20Karamoja.pdf*

UNICEF. (1991). Strategy for improved nutrition of children and women in developing countries. In *The Indian Journal of Pediatrics* (Vol. 58). Springer.

Vickers, A. J., & Altman, D. G. (2001). Analyzing controlled trials with baseline and follow-up measurements. *BMJ*, *323*(7321), 1123–1124. https://doi.org/10.1136/BMJ.323.7321.1123

World Health Organization. (2006). *WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development*. World Health Organization.

_____. (2017). Guideline: preventive chemotherapy to control soil-transmitted helminths infections in at-risk population groups. Geneva: World Health Organization; 2017. License: CC BY-NC-SA 3.0 IGO. In *WHO Press*. World Health Organization.

World Bank. (2020). Uganda: Country Overview. Retrieved on 11th October 2022. Available at *https://data.worldbank.org/country/UG*

Yamano, T., Alderman, H., & Christiaensen, L. (2005). Child Growth, Shocks, and Food Aid in Rural Ethiopia. *American Journal of Agricultural Economics*, *87*(2), 273–288.

3 ELECTED LOCAL FEMALE LEADERS AND GENDER STEREOTYPES

by

Junior Abdul-Wahab

ABSTRACT

The chapter examines how exposure to elected local female leaders affects gender stereotypes, drawing on the literature on social models of self-efficacy and the motivational theory of role modeling. Although elected officials at the local level may not have enough executive or legislative authority to implement policies, they are closer to the people and more likely to influence behavior and attitudes.

Combining survey data and data from local assembly elections in Ghana, we found that exposure to female political leaders over one election term improved women's perceptions of their role in decision-making, their right to express an opinion, and gender bias in children's education. Men's perceptions of women remain largely unaffected. Further analysis reveals no significant differences in gender relations and public goods provisions between treatment and control communities, allowing us to attribute the impact to the role model effect.

The study contributes to the discussions about enhancing female political participation by providing insights into the relationship between female political leaders and gender stereotypes in a developing country context.

3.1 Introduction

Almost three decades after the Beijing Declaration and Platform for Action (1995) called for equal participation in political decision-making, women remain underrepresented in political leadership positions worldwide. Globally women hold 21% of government ministerial appointments, 25% of parliamentary seats, and 36% of elected seats at the local level (UNWomen, 2021a). Although this represents an improvement over the 1995 average of about 10% at all levels, it is still short of what is required to achieve gender parity in political leadership.

Fairness and equality are the main reasons often advanced for increasing women's participation in political leadership. That is, women make up half of the population in most countries, so it is only fair their involvement in political decision-making is encouraged to provide parity in political discourse that is reflective of the composition of society. Furthermore, to the extent that women political leaders have different preferences from their male counterparts, encouraging women's participation in political leadership is pivotal in advancing policies and providing public goods that interest women (Chattopadhyay & Duflo, 2004; Franceschet et al., 2008). Increasing female participation in politics thus goes beyond strengthening democracy and promoting justice to serving as a precursor to inclusive growth.

Barriers to women's participation in political leadership include inadequate access to finance, lack of education and technical skills, and persistent gender stereotypes (Ara, 2019; Sossou, 2011; Thomas, 2013; UNWomen, 2018). Biased cultural and gender norms that discriminate against women limit women's participation in decision-making within and outside the household and their ability to participate in broader public discussions. Furthermore, negative stereotyping of women in the media and other public platforms strengthens the propensity for the political sphere to remain the domain of men (Stump, 2010). Ensuring equitable involvement in political decision-making is

still necessary today as it was thirty years ago. This viewpoint is underscored by the Sustainable Development Goal (SDG) 5.5, which advocates for equal participation of women at all levels of decision-making in public and political life.

Several countries have implemented gender quotas and reservations to encourage women's involvement in political leadership with some degree of success. Nearly two-thirds of countries with more than 40% female legislative participation have established some quota or reservation policy (UNWomen, 2021b). One of the widely touted success stories is Rwanda, where the proportion of female MPs rose from 18% to 64% between 1990 and 2018 after a new constitution in 2003 mandated that 30% of elected parliamentarians be female. There is also a growing interest in academic and policy circles in promoting female political leadership to break down self-stereotypes and enhance self-belief and attitudes among women (Beaman et al., 2012; Stout et al., 2011). These ideas are inspired by self-efficacy social models based on seminal work by Albert Bandura (1977). They are founded on the premise that exposure to successful individuals in groups with which one identifies strengthens belief in one's self. For instance, successful women inspire other women, influencing self-stereotypes and other obstacles women encounter in their social lives (Mongenroth et al., 2015). Furthermore, research on ethnic minorities in the United States shows that electing public officials from minority groups results in policies that benefit those communities while also increasing political empowerment for those groups (High-Pippert & Comer, 1998).

Female political leaders could influence outcomes for other women through two main channels – by implementing policies that are relevant to other women (Chattopadhyay & Duflo, 2004; Franceschet et al., 2008) and by reducing self-stereotype and strengthening self-beliefs and attitudes (Morgenroth et al., 2015; Stout et al., 2011). In some cases, policies to increase women's

participation in political leadership, such as reservation policy or a gender quota, could result in backlash or reinforce negative stereotypes about women's capabilities (Franceschet et al., 2008; O'Brien & Rickne, 2016).

In this study, we look at the effect of exposure to competitively elected local female leaders in Ghana on women's self-stereotypes and gender stereotypes. According to the literature on social models of self-efficacy, the influence of role models on attitudes depends on the degree of sociability and similarity with the role model. Thus, the impact of female political leadership at the local level, where people are more likely to connect with leaders, is of scholarly and policy interest. Furthermore, as we will demonstrate later, political leaders at the lowest level of Ghana's local government system lack sufficient executive or legislative capacity to affect policy direction. This enables us to identify the role model effect of local female leaders in a developing nation environment.

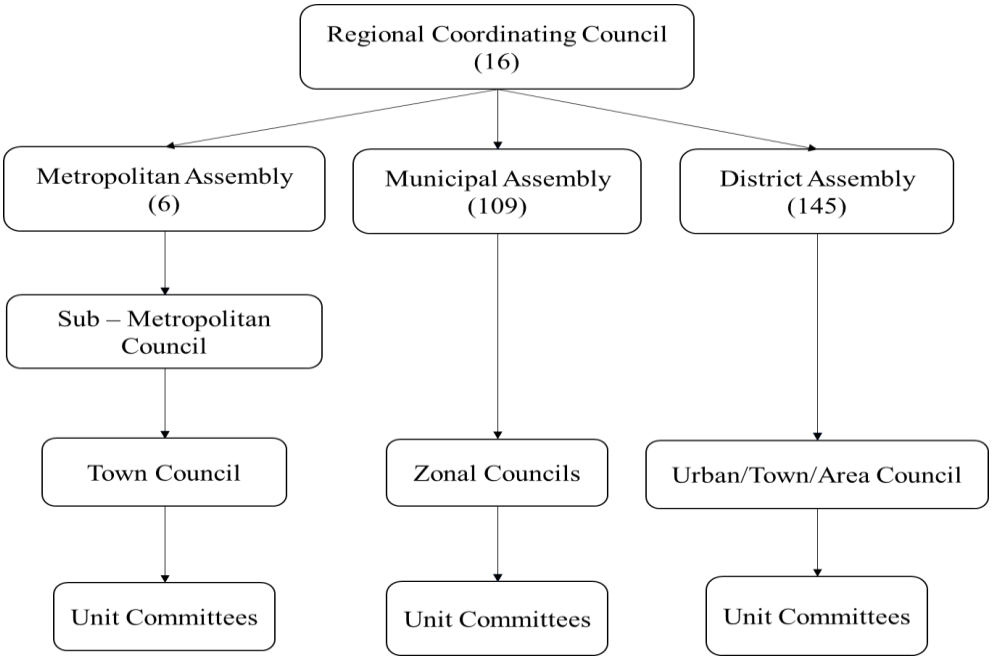
3.2 The Local Government System in Ghana

3.2.1 Overview

Ghana's 261 administrative districts are divided into 6 metropolitan areas (population greater than 250,000), 109 municipal areas (population greater than 95,000), and 145 districts (population less than 95,000). The Local Government Act of 2016 (Act 936) establishes a three-tiered sub-national governance structure at the regional, district, and sub-district levels. The Regional Coordinating Council (RCC) is the highest sub-national political body, followed by the Metropolitan, Municipal, and District Assemblies (MMDAs or Assemblies) and the Town/Zonal/Area/Unit committees. The Regional Minister serves as the chairman of the RCC. Other RCC members include the deputy or deputies to the regional minister, the Chief Executives and the Presiding Members of the MMDAs in the region, two chiefs from the Regional House of Chiefs, and heads of decentralized ministries in the area. The RCC does not directly make policies as its function is limited to coordinating the activities of MMDAs under their jurisdiction.

The MMDAs are the fulcrum of local government in Ghana. They are the highest administrative and political authority at the district level and are responsible for legislative and executive functions. The MMDAs are led by a Chief Executive, who is nominated by the President and confirmed by two-thirds of the Assembly. Members of Parliament, Assembly Members, and other members selected by the President make up the rest of the MMDAs. By law, the President's appointment does not exceed 30% of the entire membership of the MMDAs.

Figure 3.1. Structure of Ghana's Local Government



Source: Author

The General Assembly, which serves as the Assembly's legislative arm, is comprised of all members of the Assembly. The General Assembly meets at least three times each year, and the meetings are presided over by the Presiding Member, who is elected by a two-thirds majority of the Assembly. Most decisions made at the Assemblies are subject to approval by the majority of the members of the General Assembly present. The Executive Committee is responsible for the executive functions and day-to-day running of the assemblies. They offer broad recommendations to the General Assembly on the initiation, implementation, monitoring, and assessment of development programs, policies, and projects at the district level; and are also in charge of carrying out Assembly decisions. They also offer recommendations to the central government on whether to fire or hire government-appointed district officials. The committee members are the Chief

Executive, the chairperson, two members elected by Assembly members, and chairpersons of relevant executive committee subcommittees. The Executive Committee has sub-committees that make recommendations to the committee, such as development planning, social services, works, justice and security, finance, and administration. All assembly members, except the Chief Executive, must serve on at least one subcommittee. The revenue of the MMDAs come from the District Assemblies Common Fund (DACF) – not less than 5% of total government revenue; transfers from the central government – grants and payments from minor tax categories collected by the Ghana Revenue Authority (GRA) on behalf of the Assemblies; and internally generated funds – local taxes, levies, and charges for using the Assembly's facilities.

Below the MMDAs are two sub-structures: Town/Zonal/Area Councils and Unit Committees. Town, Zonal, and Area Councils oversee metropolitan, municipal, and district areas in that order. The Councils have between 15 and 20 members – ten come directly from the Unit Committees, five or fewer members from the relevant Assemblies, and five or fewer members from the local area chosen by the central government. The Unit Committee is the lowest level of the Local Government structure. The Unit Committees have a maximum of 15 members, with ten elected representatives and five additional locals chosen by the District Chief Executive on behalf of the central government.

The sub-structures below the MMDAs have no legislative or executive powers; instead, they carry out functions allocated to them by the Assembly, which do not include the authority to legislate, issue taxes, or borrow money. Some members of these substructures do not get direct remuneration for their services to the community. They, however, play a vital role in enhancing local participation in government and strengthening democratic values. They also provide an avenue for the local community and the MMDAs to debate and provide solutions to local problems.

3.2.2 Members of the Assembly

Except for Members of Parliament (MPs) and government appointees, members of the MMDAs and its sub-levels are selected from Electoral Areas (EAs) during local assembly elections. The local assembly elections are non-partisan and are held separately from national and parliamentary elections. Any Ghanaian who has lived in the EA they wish to represent for at least twelve months in the preceding four years and is of voting age is eligible to run for office. The elections follow the first-past-the-post system, meaning the candidate with the most valid votes wins.

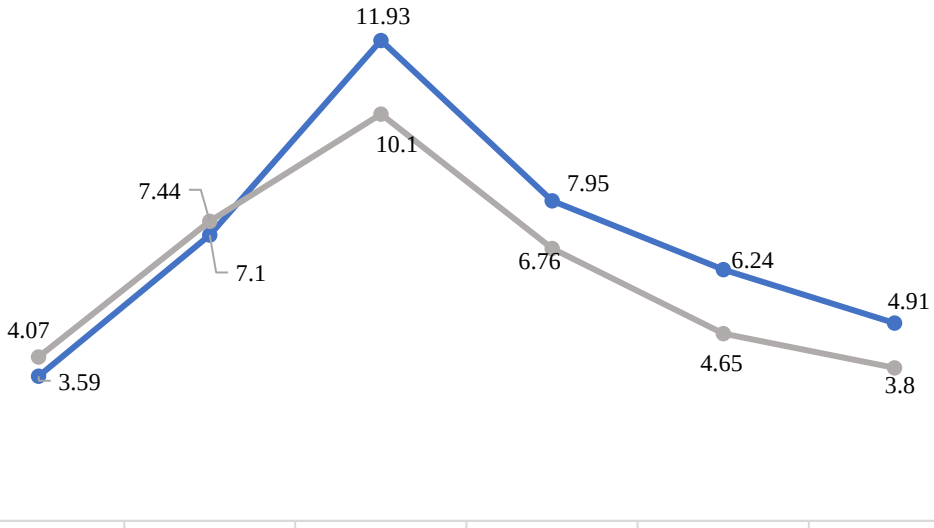
Elected Assembly members represent their EAs and the people who live in them at the Assemblies. They act as liaisons between the MMDAs and the communities they represent, advocating for the local agenda at the Assembly level and relaying Assembly decisions to their people. However, the existing structure and composition of the MMDAs limit their effectiveness as avenues for promoting local development agendas. The central government appoints the Chief Executive and 30% of its members, who are usually strategically placed within the administrative hierarchies. As a result, Chief Executive and other appointed members who set the agenda for the MMDAs are more concerned with pushing the national government's objectives (CODEO, 2016).

The Elected assembly members' position is more salient at the sub-district level, where they constitute the majority of the membership of its structures. These lower-tier councils are much closer to the people. While they lack legislative or executive authority, they are crucial in enhancing local participation in government and strengthening democratic values.

3.2.3 Women's Representation

Compared to the worldwide average of 36% and the Sub-Saharan Africa average of 29% (UNWomen, 2021), women's political representation in the local government structure in Ghana is unbelievably low. Ghana was ranked 129 out of 133 countries regarding the proportion of elected seats held by women at the local government level (UNWomen, 2021b). As seen in Figure 3.2, the proportion of women in Ghana's local assembly climbed from 4.07 percent in 1998 to 10.1 percent in 2006. It has, however, been trending downward since. The proportion of female candidates in the local assembly elections follows a similar pattern.

Figure 3.2. Trends in female participation in local assembly elections (% of total)



	1998	2002	2006	2010	2015	2019
Contestants	3.59	7.1	11.93	7.95	6.24	4.91
Elected	4.07	7.44	10.1	6.76	4.65	3.8

Data source: Boateng and Kosi (2015), UNWomen(2021b)

Barriers to women's political participation in Ghana include lack of funding, discriminatory gender norms, low levels of education, and lack of technical competence (Sossou, 2011). In most countries, women confront challenges that males do not face, impacting their confidence and ability and limiting their involvement in public discourse. Developing solutions to these challenges is essential to improving women's political participation and representation in political decision-making.

3.3 Data Source and Variable Description

The data for this study comes from the first two waves of the Ghana Socioeconomic Panel Survey (GSPS)[15] conducted in 2009-2010 and 2013-2014. The GSPS is a nationally representative dataset that covers about 5,009 households and 16,356 individuals across all the administrative regions of Ghana. The survey is a collaboration between the Global Poverty Research Lab (GPRL) at Northwestern University, the Economic Growth Center (EGC) at Yale, and the Institute of Statistical, Social, and Economic Research (ISSER) at the University of Ghana. The survey is funded by the Global Poverty Research Lab and the EGC, while ISSER conducts the fieldwork. The 2010 local assembly elections statistics come from Ghana's Electoral Commission and the GSPS community datasets. Section 3.3.1 briefly describes the local assembly election and some community characteristics. Section 3.3.2 describes the outcome variables and some respondent characteristics.

3.3.1 Local assembly elections and community characteristics

Local assembly elections in Ghana are constitutionally mandated to occur every four years. The elections are non-partisan, and candidates are legally not allowed to be supported by any political party. A contesting candidate must be 18 years or older, a registered voter, and a resident in the local Assembly in which they seek to be elected. The local assembly elections follow the first-past-the-poll voting system. Elected officials typically serve for four years, and there is no limit to the number of times an elected representative can seek reelection.

[15] The GSPS is publicly available and can be accessed at *https://egc.yale.edu/data/isser-northwestern-yale-long-term-ghana-socioeconomic-panel-survey-gsps*

Ghana's 2010 local assembly elections began on December 28th and lasted five days. The election process took longer than expected due to poor election management by the Electoral Commission, which resulted in shortages of election materials in several polling sites (CODEO, 2015). Only 1,376 of the 15,939 candidates who ran for office were female, accounting for 7.95% of the total[16]. 21.57% of the communities in our sample had at least one female candidate, and 6.67% had elected a female representative at the end of the polls. Table 3.1 below shows the summary statistics of community characteristics by gender of the elected leader.

Table 3.1. Summary statistics of community characteristics by gender of the local elected leader

	Elected male leader		**Elected female leader**		**Overall**	
Variables	Mean	SD	Mean	SD	Mean	SD
Female-headed households	0.05	0.21	0.05	0.21	0.05	0.21
Female school attendance	0.66	0.24	0.75	0.17	0.67	0.24
Female-male ratio	0.52	0.07	0.51	0.06	0.52	0.07
Age married	23.23	2.14	23.46	1.50	23.25	2.10
Attendance	0.73	0.22	0.81	0.16	0.73	0.22
Age	26.82	4.70	26.54	4.45	26.80	4.68
Electricity	0.57	0.50	0.71	0.45	0.58	0.49
Piped drinking water	0.40	0.49	0.40	0.49	0.40	0.49
Mobile phone use	0.79	0.41	0.79	0.41	0.79	0.41
Fixed line phones	0.03	0.17	0.02	0.13	0.03	0.17
Internet availability	0.07	0.25	0.05	0.22	0.07	0.25
Household size	5.26	2.82	5.20	2.97	5.26	2.83
Urban	0.32	0.46	0.27	0.45	0.31	0.46
Christianity	0.63	0.48	0.82	0.38	0.64	0.48
Islam	0.22	0.41	0.07	0.25	0.21	0.40
Traditionalist	0.11	0.31	0.07	0.26	0.11	0.31
Akan ethnic group	0.22	0.37	0.35	0.43	0.22	0.38

[16] **Error! Reference source not found.** in the appendix shows the regional and gender distribution of the candidates.

3.3.2 Outcome variables and respondent characteristics

Self-stereotypes and general stereotypes are measured by women's and men's responses to the following statements;

- "The important decisions in the family should be made only by the men of the family."
- "A wife has a right to express her opinion even when she disagrees with what her husband is saying."
- "It is better to send a son to a school than to send a daughter."

These statements are posed to all individuals in the household who are 12 years and above. Each individual is asked these questions separately without anyone else present. The responses to the statements are binary, with 1 indicating the individual agrees and 0 indicating they disagree. Table 2 below shows descriptive statistics for the outcome variables and respondent characteristics for the overall sample.

Table 3.2. Summary statistics of outcome variables and respondent characteristics by respondent's gender

	Female					**Male**				
Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Period = Before										
Important decisions by men only	6185	0.34	0.47	0	1	4574	0.39	0.49	0	1
A wife can express her opinion	6179	0.85	0.36	0	1	4577	0.83	0.38	0	1
Better son to a school than a daughter	6160	0.13	0.33	0	1	4572	0.16	0.37	0	1
Husband Insulted*	3341	0.4	0.95	0	5	-	-	-	-	-
Husband threatened*	3341	1.13	0.49	1	5	-	-	-	-	-
Husband pushed, hit, or slapped*.	3336	1.07	0.35	1	5	-	-	-	-	-
Husband restricts movement*	3334	0.4	0.49	0	1	-	-	-	-	-
Husband accused you of infidelity*	3339	0.05	0.21	0	1	-	-	-	-	-
Age in years	6183	37.77	18.86	12	109	4574	38.97	18.83	12	105
Married	6101	0.46	0.5	0	1	4520	0.54	0.5	0	1
Ever attended School	6116	0.61	0.49	0	1	4536	0.74	0.44	0	1

	Female					Male				
Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Household head	6185	0.26	0.44	0	1	4574	0.71	0.46	0	1
Period = After										
Important decisions by men only	6146	0.43	0.5	0	1	5161	0.51	0.5	0	1
A wife can express her opinion	6140	0.89	0.32	0	1	5150	0.85	0.35	0	1
Better son to a school than a daughter	6172	0.07	0.26	0	1	5178	0.12	0.32	0	1
Husband Insulted*	3504	0.61	1.22	0	5	-	-	-	-	-
Husband threatened*	3506	1.19	0.61	1	5	-	-	-	-	-
Husband pushed, hit, or slapped*.	3505	1.12	0.45	1	5	-	-	-	-	-
Husband restricts movement*	3506	0.42	0.49	0	1	-	-	-	-	-
Husband accused you of infidelity*	3496	0.09	0.28	0	1	-	-	-	-	-
Age in years	6146	38.34	19.31	12	120	5161	36.16	19.49	12	114
Married	6144	0.43	0.49	0	1	5160	0.44	0.5	0	1
Ever attended School	6145	0.65	0.48	0	1	5161	0.79	0.4	0	1
Household head	6146	0.28	0.45	0	1	5161	0.59	0.49	0	1

*Asked only to women who have been in a relationship over the last 12 months. Before (or baseline) is 2009/2010, and After (or follow-up) is 2013/2014. For each period, respondent characteristics - age in years, married, ever attended school, and household head- are shown in the last four rows.

For the respondent characteristics, Table 3.2 shows that the number of female respondents was more than male respondents over the two periods. The range of age of respondents is between 12 to 109 years at baseline. The average age of females was slightly lower, 38, compared to the average age of males, 39, at baseline. At follow-up, the average age of females was about 38, higher than 36 for men. Nearly half of the male respondents were in legally recognized unions in both periods, compared to the female average of 45% at baseline and 43% at follow-up. Male respondents were more likely than females to have ever attended school and were also more likely to be household heads than females.

3.4 Empirical Model and Estimation Strategy

The study employs a difference-in-differences (DID) technique to examine the effect of exposure to elected female leaders on the outcome variables. DID is a quasi-experimental approach that uses data from a group (or individuals) impacted by a policy or intervention and those that were not to obtain an appropriate counterfactual to estimate the causal effect of the policy or intervention. DID relies on the parallel trend assumptions, i.e., in the absence of the intervention, the differences between control and treatment groups are the same over time. The DID estimate is the change in the average of the outcome variable over time for the intervention and non-intervention groups, as shown in (*3.1*) below.

$$DID = \left(\bar{y}_{c=fl,t=after} - \bar{y}_{c=fl,t=before}\right) - \left(\bar{y}_{c=ml,t=after} - \bar{y}_{c=ml,t=\ before}\right) \tag{3.1}$$

where $\bar{y}$ represents the average outcome variable across all individuals in a given group at a particular period. *c* represents the two groups of communities – *fl* communities with female leaders and *ml* communities with male leaders. *t* represents time – *before* and *after* are the period before and after the treatment. The first term in parenthesis in equation (3.1) describes the change in the average of the outcome variable over time for communities with elected female leaders. The second term is the change in the average of the outcome variable over time for untreated communities; it is a proxy for the counterfactual change in the outcome variable in the treated group. The DID estimate is typically estimated using regression analysis as in equation (*3.2*) to obtain the standard errors required to compute the statistical significance of the means and differences.

$$y_{it} = \alpha_0 + \alpha_1 T + \alpha_2 FL + \alpha_3 (T * FL) + \varepsilon_{it} \quad (3.2)$$

Where y_{it} represents the outcome variable for individual i at time t. T is a dummy variable that equals 1 for the post-period and 0 for the pre-period. FL is 1 for communities with an elected female leader and 0 for communities with male leaders. $(T*FL)$ is a composite variable that equals 1 for FL =1 and $T = 1$. The estimates of the parameters of equation (*3.2*) can be expressed in terms of averages as in equation (*3.1*) as follows;

$$\begin{gathered} \hat{\alpha}_0 = \hat{E}(y \mid c = 0, T = 0) \\ \hat{\alpha}_1 = \hat{E}(y \mid c = 0, T = 1) - \hat{E}(y \mid c = 0, T = 0) \\ \hat{\alpha}_2 = \hat{E}(y \mid c = 1, T = 0) - \hat{E}(y \mid c = 0, T = 0) \\ \hat{\alpha}_3 = [\hat{E}(y|c = 1, T = 1) - \hat{E}(y|c = 1, T = 0)] - [\hat{E}(y|c = 0, T = 1) - \hat{E}(y|c = 0, T = 0)] \end{gathered} \quad (3.3)$$

$\hat{E}(... \mid ...)$ depicts the conditional average computed on the sample; $\hat{\alpha}_0$ is the baseline average in the control group; $\hat{\alpha}_1$ is the change in the outcome variable for the control group – it is an estimate of the counterfactual; $\hat{\alpha}_2$ is the baseline difference between the control and treatment group; and and α_3 is the difference-in-differences estimate.

As mentioned, the validity of the DID approach depends on the assumption that there are no time-varying differences between the two groups of communities, also known as the parallel trends (or equal trends) assumption. A major concern with using observational data for this exercise is that the composition of the two groups may change, or the communities may differ in ways that affect the trend of the outcome variables over time. Since the data for this study is longitudinal, there is minimal risk that the composition of the two groups differs substantially over time. There is, however, a threat that baseline differences in the two groups of communities could potentially

affect the trends of the outcome variables over time, i.e., a violation of the parallel trends assumption. Researchers typically assess the parallel trend assumption in studies with multiple pre-treatment periods by visually inspecting trends in the outcome variables. Other approaches, such as placebo tests with false treatment or outcome variables or using different comparison groups, have been proposed in studies with only two periods. Placebo tests that show no impact or DID that give similar estimates using different comparison groups support the parallel trend assumption (Gertler et al., 2016).

The Propensity Score Matching (PSM) technique, developed by Rosenbaum and Rubin(1983), is another frequently used method for minimizing bias in the analysis of observational data. The PSM technique mimics a randomized experiment by matching treated units with an identical control group based on some observed baseline characteristics. The PSM approach helps evaluate unbiased treatment effects when random intervention or treatment assignment is unethical, impractical, or not feasible. For instance, one cannot randomly assign the gender of election participants or winners in competitive elections. A reservation policy is an alternative approach; however, since it is not necessarily a competitive election process, its actual effects on perceptions are challenging to identify due to potential backlash from less prioritized groups.

The advantage of the PSM over other quasi-experimental techniques is that it can use many covariates to balance the treatment and control groups without significantly reducing the number of observations. PSM also minimizes bias since the method does not use the outcome variable, separating the study's design from the analysis (Rosenbaum, 2010; Rubin, 2007). A major limitation of PSM is that it only accounts for observable differences, any bias due to unobservable characteristics may remain after matching. The study conducts additional tests using placebo

outcome variables and different comparison groups to assess the equal trends assumption in the matched sample and to minimize such concerns.

3.5 Estimation Results

This section presents the estimation results of the effect of exposure to competitively elected local female leaders on self and general stereotypes. The section is organized into five subsections. Section 3.5.1 examines the relationship on the whole sample using a standard difference-in-differences estimation technique. Section 3.5.2 examines the relationship in a sub-sample of communities with at least one female contestant in the election. Section 3.5.3 examines the relationship on the full sample using difference-in-differences with PSM.

Sections 3.5.4 and 3.5.5 examine the validity of the identification strategy. Section 3.5.4 employs gender relations as an outcome variable. Section 3.5.5 uses public goods provisions as a placebo outcome variable.

3.5.1 General Difference-in-Differences

Table 3.3 presents the estimation results for the entire sample using a standard difference-in-differences approach. Estimation results for males and females are in separate columns for each outcome variable. The table also shows the average outcome variable for the two groups before and after the intervention. The first row of the table shows the difference-in-differences estimates (diff-in-diff).

Results in Table 3.3, columns (1) and (2) indicate that women in communities with elected female leaders were 7.3 percentage points more likely to disagree that *'important decisions in the family should be made by men only'* compared to women in communities with male leaders. However, the change in men's response to the same statements is insignificant. For the outcome variable, *'women can express their opinion if they disagree with their husband,'* the results indicate that exposure to local female leaders increases the likelihood that women agree with the statement by

7.2 percentage points, while men's response was not significantly affected. The results in columns (5) and (6) show that women's response to the statement, *'it is better to send a son to a school than a daughter,'* did not change significantly; however, men's likelihood of agreeing to the statement increased by 7.3 percentage points.

Table 3.3. Difference-in-differences estimates of exposure to locally elected female leaders on general and self-stereotypes (whole sample)

	Important decisions by men only		**Women can express their opinion**		**Better son to school**	
	Women	Men	Women	Men	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Diff-in-diff	-0.073*	0.003	0.072**	0.018	0.041	0.073**
	(0.041)	(0.046)	(0.029)	(0.034)	(0.025)	(0.032)
Obs.	9,370	7,424	9,359	7,418	9,374	7,434
Before						
Mean control	0.342	0.395	0.846	0.824	0.133	0.166
Mean treated	0.277	0.205	0.811	0.839	0.081	0.08
Diff.	-0.065	-0.189	-0.0366	0.016	-0.052	-0.086
After						
Mean control	0.439	0.530	0.890	0.851	0.0746	0.121
Mean treated	0.301	0.343	0.927	0.885	0.0633	0.108
Diff.	-0.138	-0.186	0.037	0.034	-0.011	-0.013

Estimation results using standard difference-in-differences. Important decision by men only is the response to "important decisions in the family should be made by men only." Women can express their opinion is the response to "women can express their opinion if they disagree with their husband." Better son to school is the response to "it is better to send a son to a school than a daughter." The outcome variable is 1 if the respondent agrees with the statement and 0 if they disagree. Responses are from individuals 12 years and older. Control is communities with an elected male leader. Treatment is communities with an elected female leader. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

It is interesting to note what is driving the favorable outcomes for women. The means in the bottom half of column (1) show that women in both the treatment and control communities were more likely to agree with the statement '*important decisions should be made by men only*' in the after-period than in the before-period. The favorable outcome for women in treatment communities was

because the change was much worse among women in the control group. In column (3), the positive outcome for women is driven by both a positive absolute and relative change. Women in treatment communities were more likely to agree with the statement in the after-period than at baseline. The change was much larger than for women in control communities, who also experienced a positive difference.

For males, the data in columns (2) and (4) show that changes in control and treatment were almost identical, resulting in a negligible difference over time. The positive effect observed in column (6) for males is because while men in control communities were more likely to disagree with the statement *'it is better to send a son to a school than a daughter'* in the after-period than before, men in treatment communities were more likely to agree.

Overall, the findings using a standard difference-in-differences estimation technique on the whole sample indicate that women in communities with an elected female leader had better self-efficacy outcomes over the period than those with male leaders. However, men's perception of women in communities with elected female leaders remained unchanged and was sometimes worse. The findings, however, cannot be conclusively attributed to the causal effect of exposure to female leaders due to the potential time-varying differences among the communities. The robustness of the findings is tested in subsequent analyses using the approaches outlined in Section 3.4.

3.5.2 Difference-in-differences using a restricted sample

In this sub-section, we reexamine the effect of exposure to locally elected female leaders on general and self-stereotypes by restricting the sample to communities with at least one female candidate in the 2010 local assembly elections. Since all treated communities should have had at least one

female contestant, the main difference between the estimations in Section 3.5.1 and this section is the difference in the control group. About 21.57% of communities had at least one female candidate on the ballot; this reduces the sample to about 20% of the original sample size. While this substantially reduces the sample size, the treatment and comparison communities are arguably more likely to have similar trends.

Table 3.4 below shows the difference-in-differences estimation results using the restricted sample of communities with at least one female contestant. Each column shows the estimation results for men and women. The first row of the table shows the difference-in-differences estimates (Diff-in-diff).

Table 3.4. Difference-in-differences estimates of exposure to locally elected female leaders on general and self-stereotypes (restricted sample)

Outcome variable	**Important decisions by men only**		**Women can express their opinion**		**Better son to school**	
	Women	Men	Women	Men	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Diff-in-diff	-0.168***	-0.084*	0.077**	0.008	-0.069***	-0.012
	(0.045)	(0.049)	(0.032)	(0.038)	(0.025)	(0.032)
Obs.	1,916	1,588	1,916	1,585	1,921	1,587
Before						
Mean control	0.265	0.309	0.876	0.834	0.0444	0.0819
Mean treated	0.277	0.205	0.811	0.839	0.0811	0.0804
Diff.	0.0115	-0.103	-0.0649	0.00498	0.0367	-0.00151
After						
Mean control	0.457	0.531	0.915	0.872	0.0955	0.122
Mean treated	0.301	0.343	0.927	0.885	0.0633	0.108
Diff.	-0.156	-0.188	0.0121	0.0126	-0.0322	-0.0138

Estimation results for a restricted sample of communities with at least one female contestant. Important decision by men only is the response to "important decisions in the family should be made by men only." Women can express their opinion is the response to "women can express their opinion if they disagree with their husband." Better son to school is the response to "it is better to send a son to a school than a daughter." The outcome variable is 1 if the respondent agrees with the statement and 0 if they disagree. Control is communities with an elected male leader. Treatment is communities with an elected female leader. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3.4 column(1) shows that women in communities with an elected female leader experienced a 16.8 percentage point change in the likelihood that they disagree with the statement '*important decisions in the family should be made by men only'* compared to women in communities with an elected male leader. Column (3) indicates that women in treatment communities were 7.7 percentage points more likely than women in control communities to agree that *'women can express their opinion if they disagree with their husband.'* And column (5) shows that compared to women in the control communities, women in treatment communities were 6.9 percentage points likely to disagree that *'it is better to send a son to a school than a daughter.'*

For men, the results in column (2) indicate that compared to men in control communities, men in treatment communities experienced an 8.4 percentage point change in the likelihood that they disagree that *'important decisions in the family should be made by men only.'* Results in columns (3) and (5) are not significant.

The main difference between the findings here (using the restricted sample) and the results in Section 3.5.1 (using the full sample) is that the effect is larger in magnitude and more precisely estimated for women. The difference is about 9.5 percentage points larger for '*important decisions in the family should be made by men only,'* 0.5 percentage points larger for *'women can express their opinion,'* and 11 percentage points larger in absolute terms for *'better son to a school than a daughter.'*

For men, the main difference is that the effect of '*important decisions in the family should be made by men only'* is now negative, although marginally significant. The effect remains insignificant for

the outcome variable *'women can express their opinion.'* Although negative, the results for *'better son to a school than a daughter'* is not significant at any conventional level.

Overall, the findings indicate that among communities with at least one female contestant on the ballot, women in communities where a female was late elected showed improved perceptions of their self-efficacy attributes and gender bias in child education. Men's perception of women regarding *'important decisions in the family should be made by men only'* showed some improvement, although the coefficient is only marginally significant.

3.5.3 Difference-in-Differences with Matching

The validity of the estimations in sections 3.5.1 and 3.5.2 depends on the assumption that baseline differences in treated and comparison communities are constant over time. Restricting the sample to communities with at least one female contestant in 5.2 and the panel structure of the dataset, which ensures that the composition of the individuals in the communities remains relatively stable over time, make this assumption more probable. However, it does not guarantee that it holds. In the absence of data to explicitly evaluate the parallel trends assumption, we employ a Propensity Score Matching (PSM) technique to simulate a randomized experiment.

Ideally, the variables used in estimating the propensity scores should potentially influence both the outcome and treatment. Other researchers have also argued that including variables related to the outcome but unrelated to the exposure in the propensity score model increases efficiency without increasing bias (Brookhart et al., 2007). The variables used in the propensity score model are average female education, the female-male ratio, education level, age, urban, religion, ethnicity, and administrative regions. The treatment and control groups are matched using the kernel

propensity-score technique with Epanechnikov weights and a bandwidth of 0.05, as described by Blundell and Costa-Dias (2009). Kernel matching compares all treated units to a weighted average of all controls, with weights inversely proportional to the distance between the propensity scores of the treated and control groups (Baser, 2006). Table 3.12 and ***Error! Reference source not found.*** in the appendix show the covariate baseline balance and the standardized bias in the covariates before and after matching. Table 3.5 below shows the estimation results using difference-in-differences on the matched sample.

Table 3.5 Difference-in-differences with Propensity Score Matching estimates of exposure to locally elected female leaders on general and self-stereotypes

Outcome variables	**Important decisions by men only**		**Women can express their opinion**		**Better son to school**	
	Women	Men	Women	Men	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Diff-in-diff	-0.110***	-0.045	0.063**	-0.010	-0.005	0.028
	(0.040)	(0.044)	(0.029)	(0.034)	(0.024)	(0.030)
Obs.	7,061	5,400	7,059	5402	7,042	5,395
Before						
Mean control	0.270	0.257	0.866	0.863	0.107	0.115
Mean treated	0.277	0.205	0.811	0.839	0.081	0.080
Diff.	0.008	-0.052	-0.055	-0.024	-0.026	-0.035
After						
Mean control	0.403	0.440	0.919	0.919	0.094	0.115
Mean treated	0.301	0.343	0.927	0.885	0.063	0.108
Diff.	-0.102	-0.097	0.008	-0.034	-0.031	-0.007

Estimation results using difference-in-differences with kernel propensity score matching. Important decision by men only is the response to "important decisions in the family should be made by men only." Women can express their opinion is the response to "women can express their opinion if they disagree with their husband." Better son to school is the response to "it is better to send a son to a school than a daughter." The outcome variable is 1 if the respondent agrees with the statement and 0 if they disagree. Control is communities with an elected male leader. Treatment is communities with an elected female leader. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3.5 shows that exposure to locally elected female leaders lowered the likelihood that women agreed with the statement *'important decisions in the family should be made by men only'* by 11 percentage points. Women in treatment communities also had a 6.3 percentage point higher chance of agreeing that *'women can express their opinion if they disagree with their husband.'* However, women's response to the statement, "*it is better to send a son to a school than a daughter,*" does not seem significantly influenced, although negative. Exposure to locally elected female leaders does not appear to have a significant impact on men's perceptions across all outcome variables.

The findings with the matched sample are similar to the restricted sample in section 3.5.2. Exposure to elected local female leaders decreases women's self-stereotypes; specifically, it improves women's perceptions of their role in decision-making, their ability to express their opinion, and gender bias in child education. However, general stereotypes, as proxied by men's perceptions of women's participation in important decisions, women's expression of their opinions, and son preference in education, remain largely unaffected.

3.5.4 Difference-in-Differences with Matching (Placebo outcome variable - gender relations)

As argued earlier, the PSM technique reduces bias by eliminating baseline differences in observable characteristics between treatment and control communities, as shown in **Error! Reference source not found.**. It does not account for time-varying unobservable factors that may affect trends in the outcome variables over time. If such unobservable confounders exist or are likely, then any association between the treatment and outcome variable can be partly attributed to the confounder (Brookhart et al., 2007). To minimize such concerns that confounders may be

driving the findings, we conduct a falsification test by examining the effect of the treatment on gender relations.

Using gender relations as a placebo outcome variable allows us to accomplish two objectives simultaneously. Our findings directly imply that exposure to female leaders impacted women's self-efficacy attributes, while men's perception of women was not affected. Therefore, we should not observe any significant impact on gender relations for the finding to hold. Also, we contend that time-varying unobservable likely to confound our results, would most likely manifest in gender relations. As such, evidence of no significant differences between treatment and control groups implies the communities have similar trends regarding gender relations.

As a measure of gender relations, the study employs women's reports of the frequency of Intimate partner violence (IPV) relating to verbal abuse, threats, physical abuse, restriction on mobility, and accusations from their partners. Table 3.6 shows the difference-in-differences estimates for gender relations between matched treatment and control communities.

Table 3.6. Difference-in-differences with Propensity Score Matching estimates of exposure to locally elected female leaders on gender relations

VARIABLES	**Verbal Abuse** (1)	**Threats** (2)	**Physical abuse** (3)	**Restrict mobility** (4)	**Accused** (5)
Diff-in-diff	0.043	0.087	0.012	0.093	0.041
	(0.124)	(0.058)	(0.037)	(0.060)	(0.028)
Observations	3,739	3,738	3,739	3,733	3,734
Before					
Mean control	0.453	1.122	1.040	0.470	0.049
Mean treated	0.236	1.036	1.024	0.412	0.012
Diff.	-0.217	-0.085	-0.016	-0.058	-0.036
After					
Mean control	0.815	1.201	1.087	0.447	0.097
Mean treated	0.641	1.202	1.083	0.482	0.101
Diff.	-0.174	0.002	-0.003	0.036	0.004

Estimation results using difference-in-differences with kernel propensity score matching. Verbal abuse, Threats, Physical abuse, Restrict mobility, and Accused (of infidelity) are women's responses on how frequently they suffer this abuse at the hands of their partners. Treated are communities with an elected female leader, and control are communities with elected male leaders. Robust standard errors are in parentheses. *** significant at <1%, **significant at <5%, significant at <10%.

Table 3.6 shows no significant differences in all gender relations indicators between treated and control communities. This result supports the finding that exposure to elected female leaders improved female perceptions of their self-efficacy attributes and not male perceptions of female self-efficacy since actual gender relation outcomes remain unchanged. Furthermore, while this does not give definitive proof of the lack of unobservable differences, it does show that the treatment and matched comparison groups had similar trends in gender relations. This proves that the equal trends assumption holds in the matched sample, lending credence to the difference-in-differences with matching estimates.

3.5.5 Difference-in-Differences with Matching (Placebo outcome variable - public goods)

A large volume of literature contends that the leader's group identity affects public goods allocation. For instance, Besley et al. (2004) show that in India, reservation of leadership positions by caster or tribe increased access to toilets, electricity, and water in households belonging to the same caste or tribe as the leader. Furthermore, Chattoparday and Duflo (2004) show that Grand Panchayats reserved for women provided more public goods that are preferred mostly by women., To demonstrate that the change in female perceptions about their self-efficacy is due to the role-model effect rather than the provision of public goods most preferred by women, we examine the difference in drinking water, electricity, and toilet availability in treatment and control communities. The assumption here is that women are more inclined to prefer these public goods

since having access to them eases the burden of domestic responsibilities, which often fall disproportionately on them. Table 3.7 shows the difference-in-differences estimates in the provision of public goods between matched treatment and control communities.

Table 3.7. Difference-in-differences with Propensity Score Matching estimates of locally elected female leaders and public goods provision

VARIABLES	Electricity (1)	Drinking water (2)	Toilet Availability (3)
Diff-in-diff	-0.021	-0.028	0.007
	(0.023)	(0.025)	(0.020)
Observations	20,580	20,788	20,788
Before			
Mean control	0.534	0.360	0.779
Mean treated	0.638	0.369	0.821
Diff.	0.104	0.0095	0.0419
After			
Mean control	0.716	0.462	0.777
Mean treated	0.799	0.443	0.825
Diff.	0.0832	-0.0185	0.0485

Estimation results using difference-in-differences on the matched sample. All outcome variables are binary. Electricity is 1 if a household has access to electricity, Drinking water is 1 if a household has access to piped water for drinking, and Toilet availability is 1 if a household has access to a toilet facility; 0 if a household does not have access. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3.7 reveals no significant differences in access to electricity, drinking water, and toilet in treatment and control communities. This implies that the gender of the elected female leader did not affect the provision of public goods. This is expected as elected local leaders do not have any executive or legislative authority but act as a liaison between the district assembly and the communities. An alternative interpretation of the findings in Table 3.7 is to say that treatment and control communities have similar trends in public goods provisions.

To the extent that women prefer the provision of these public goods compared to men, we can be confident that changes in women's self-efficacy attributes and reduction in gender bias in child education were not driven by public goods provision. Similar to findings by Beaman et al. (2012) in India, we are confident that changes in women's self-stereotype primarily reflect the role model effect.

3.6 Summary and Conclusion

This study highlighted the underrepresentation of women in political leadership and underscored the importance of improving female representation in political decision-making. Following previous research and recent trends in female political participation, we argued that gender stereotypes constitute a considerable barrier to women's participation in political leadership, especially in developing countries.

The study sought to examine how exposure to competitively elected local female leaders affects gender stereotypes, drawing on the literature on social models of self-efficacy and the motivational theory of role modeling. While elected officials at the local level may not have enough executive or legislative authority to implement policies, they play an essential role in enhancing local participation in government and promoting democratic values. Based on difference-in-differences with PSM, the empirical findings suggest that exposure to competitively elected female political leaders over one election term (four years) improved measures of women's self-stereotype by 6.3 to 11.0 percentage points. On the other hand, men's perceptions of women remain largely unaffected. Further analysis reveals no significant differences in gender relations and public goods provisions between treatment and control communities, which allows us to attribute the findings to the role model effect.

The findings of this study give good insights into the link between competitively elected local female political leaders and gender stereotypes. The results are consistent with the literature on role modeling, social models of self-efficacy, and motivational theory. For instance, Stout et al. (2011) show that exposure to specialists in Science, Technology, Engineering, and Mathematics (STEM) subjects increases girls' self-efficacy in the field even though negative stereotypes about women's ability in STEM remained unchanged. Also, Beaman et al. (2012) show that reserving

council seats for women in India increased young girls' aspirations and parents' aspirations of their girl child, while boys were unaffected.

This study is also one of the few to examine a direct causal link between the role model effect of female political leaders and women's perception of their participation in household decision-making, freedom to express an opinion, and gender bias in child education in a developing country context. Since this study examines the effect in one election term, it will be prudent to analyze how exposure to female leaders influences men's perceptions of women over multiple election cycles. The big question is whether men's perceptions are unaffected or change rather slowly than women's. Examining this would require more data points over multiple election cycles than we have for this study.

3.7 Appendix

3.7.1 Appendix I. 2010 local assembly elections

Table 3.8. Participation in District Assembly Elections by Sex (1998-2015)

		1998	2002	2006	2010	2015	2019
Contestants	Female (%)	3.59	7.10	11.93	7.95	6.24	4.91
	Male (%)	96.41	92.90	88.07	92.05	93.76	95.08
Elected	Female (%)	4.07	7.44	10.10	6.76	4.65	3.80
	Male (%)	95.93	92.56	89.90	93.24	95.35	96.20

Data Source: Boateng and Kosi (2015), Electoral Commission of Ghana (2021), and UNWomen (2021)

Table 3.9. Regional and gender distribution of contestants in Ghana's 2010 local assembly election.

Region	**Male**		**Female**		Proportion of communities with female assemble member
	Number	Percentage	Number	Percentage	
Western Region	1469	94.47%	86	5.53%	15.38%
Central Region	1544	92.79%	120	7.21%	12.5%
Greater Accra Region	1136	89.52%	133	10.48%	6.67%
Volta Region	1646	89.80%	187	10.20%	3.45%
Eastern Region	2110	91.42%	198	8.58%	7.69%
Ashanti Region	3153	92.93%	240	7.07%	4.44%
Brong Ahafo	1830	92.47%	149	7.53%	8.33%
Northern Region	1604	91.71%	145	8.29%	3.23%
Upper East Region	826	92.19%	70	7.81%	0%
Upper West Region	621	92.83%	48	7.17%	0%
Total	15939	92.05%	1376	7.95%	6.67

Data Source: Electoral Commission of Ghana, Election nomination statistics (2010), and GSPS.

3.7.2 Appendix II: Summary statistics

Table 3.10. Summary statistics of community characteristics by gender of elected leader and period.

	Elected male leader				Elected female leader				Overall			
Variable	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Period = Before												
Age married	23.4	2.3	17.6	40.6	23.6	1.7	21.8	29.2	23.4	2.3	17.6	40.6
Attendance	0.7	0.2	0.1	1	0.8	0.2	0.4	0.9	0.7	0.2	0.1	1
Female-male ratio	26	4.5	17.6	56.1	25.5	4	20.5	38.9	26	4.5	17.6	56.1
Female attendance	0.6	0.3	0	1	0.7	0.2	0.3	0.9	0.7	0.3	0	1
Female-male ratio	0.5	0.1	0.3	0.8	0.5	0.1	0.4	0.6	0.5	0.1	0.3	0.8
Piped drinking water	0.37	0.48	0	1	0.37	0.48	0	1	0.37	0.48	0	1
Mobile phone use	0.72	0.45	0	1	0.72	0.45	0	1	0.72	0.45	0	1
Fixed line phones	0.05	0.22	0	1	0.02	0.13	0	1	0.05	0.22	0	1
Internet availability	0.08	0.27	0	1	0.03	0.18	0	1	0.08	0.27	0	1
Household size	5.44	2.88	1	20	5.44	2.99	1	17	5.44	2.89	1	20
Female-headed households	0.09	0.28	0	1	0.09	0.28	0	1	0.09	0.28	0	1
Urban	0.32	0.47	0	1	0.26	0.44	0	1	0.32	0.47	0	1
Christianity	0.63	0.48	0	1	0.82	0.38	0	1	0.64	0.48	0	1
Islam	0.22	0.41	0	1	0.07	0.25	0	1	0.21	0.4	0	1
Traditionalist	0.11	0.31	0	1	0.07	0.26	0	1	0.11	0.31	0	1
Akan	0.4	0.43	0	1	0.64	0.39	0	1	0.42	0.43	0	1
Electricity	0.5	0.5	0	1	0.64	0.48	0	1	0.51	0.5	0	1
Period = After												
Age married	23.1	1.9	18.4	29.6	23.3	1.3	20.6	26.1	23.1	1.9	18.4	29.6
Attendance	0.7	0.2	0.1	1	0.8	0.2	0.5	1	0.8	0.2	0.1	1
Female-male ratio	27.7	4.8	16.2	58.7	27.9	4.6	22.1	39.4	27.8	4.8	16.2	58.7
Female attendance	0.7	0.2	0	1	0.8	0.2	0.4	1	0.7	0.2	0	1
Female-male ratio	0.5	0.1	0.3	0.8	0.5	0.1	0.4	0.6	0.5	0.1	0.3	0.8
Piped drinking water	0.44	0.5	0	1	0.44	0.5	0	1	0.44	0.5	0	1
Mobile phone use	0.86	0.35	0	1	0.88	0.33	0	1	0.86	0.35	0	1
Fixed line phones	0.01	0.08	0	1	0.02	0.13	0	1	0.01	0.08	0	1
Internet availability	0.06	0.23	0	1	0.07	0.26	0	1	0.06	0.23	0	1
Household size	5.06	2.73	1	17	4.9	2.91	1	15	5.04	2.74	1	17
Female-headed households	0.09	0.28	0	1	0.09	0.28	0	1	0.09	0.28	0	1

Variable	Elected male leader				Elected female leader				Overall			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Urban	0.31	0.46	0	1	0.29	0.45	0	1	0.31	0.46	0	1
Christianity	0.63	0.48	0	1	0.82	0.38	0	1	0.64	0.48	0	1
Islam	0.22	0.41	0	1	0.07	0.25	0	1	0.21	0.4	0	1
Traditionalist	0.11	0.31	0	1	0.07	0.26	0	1	0.11	0.31	0	1
Akan	0.4	0.43	0	1	0.64	0.39	0	1	0.42	0.43	0	1
Electricity	0.65	0.48	0	1	0.8	0.4	0	1	0.66	0.47	0	1

Table 3.11. Summary statistics of outcome variables and respondent characteristics overall.

Respondent gender		Female			Male		
Variable	Type	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
Outcome Variables							
Important decisions by men only	Binary	12,331	0.38	0.49	9,735	0.46	0.5
A wife can express her opinion	Binary	12,319	0.87	0.34	9,727	0.84	0.36
Better son to school than a daughter	Binary	12,332	0.1	0.3	9,750	0.14	0.34
Husband Insulted*	Continuous	6,845	0.51	1.11	-	-	-
Husband threatened*	Continuous	6,847	1.16	0.55	-	-	-
Husband pushed, hit, or slapped*.	Continuous	6,841	1.09	0.4	-	-	-
Husband restricts movement*	Binary	6,840	0.41	0.49	-	-	-
Husband accused you of infidelity*	Binary	6,835	0.07	0.25	-	-	-
Respondent Characteristics							
Age	Continuous	12,329	38.06	19.09	9,735	37.48	19.23
Married	Binary	12,245	0.45	0.5	9,680	0.49	0.5
Ever attended school	Binary	12,261	0.63	0.48	9,697	0.77	0.42
Household head	Binary	12,331	0.27	0.44	9,735	0.64	0.48

*Asked only to women who have been involved in a relationship over the last 12 months

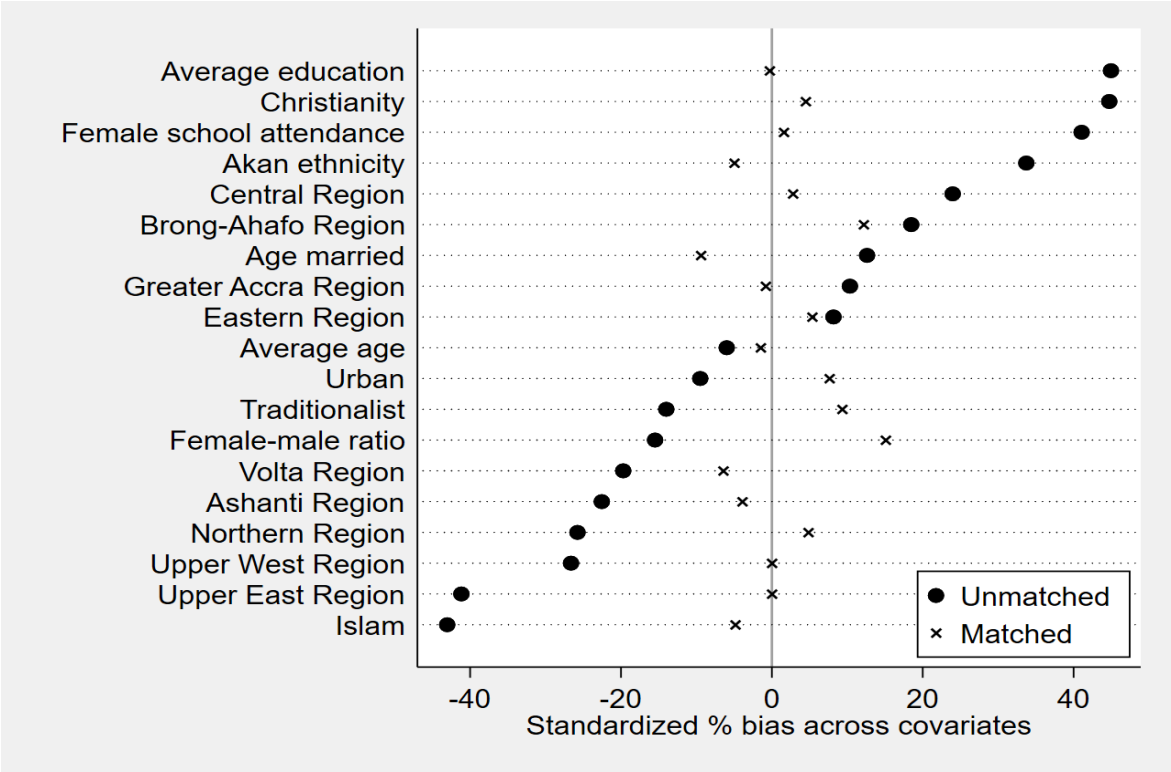
3.7.3 Appendix III: Propensity Score Matching - Tests

Table 3.12. Balance test of baseline variables for PSM

	Before Matching			After Matching		
Variable	Control (1)	Treatment (2)	Difference (1)-(2)	Control (3)	Treatment (4)	Difference (3)-(4)
Age married	23.358	23.584	-0.226***	23.558	23.52	-0.038
Ever attended school	0.711	0.796	-0.084***	0.778	0.787	0.008
Age	26.028	25.447	0.581***	25.879	25.812	-0.067
Female attendance rate	0.643	0.730	-0.087***	0.708	0.718	0.01
Female ratio	0.525	0.515	0.010***	0.522	0.519	-0.003
Urban	0.323	0.259	0.063***	0.255	0.233	-0.022
Christian	0.628	0.823	-0.195***	0.787	0.818	0.031
Muslim	0.215	0.069	0.147***	0.1	0.081	-0.019
Traditional	0.111	0.071	0.040***	0.079	0.071	-0.008
Akan - matrilinear ethnic group	0.401	0.642	-0.242***	0.588	0.62	0.032
Central Region	0.065	0.140	-0.076***	0.13	0.159	0.029
Greater Accra Region	0.078	0.103	-0.025***	0.089	0.084	-0.005
Volta Region	0.108	0.053	0.055***	0.09	0.078	-0.012
Eastern Region	0.095	0.106	-0.011	0.108	0.098	-0.01
Ashanti Region	0.173	0.095	0.078***	0.12	0.095	-0.025
Brong Ahafo	0.086	0.146	-0.060***	0.109	0.142	0.033
Northern Region	0.203	0.105	0.098***	0.131	0.118	-0.013
Upper East Region	0.073	0.000	0.073***	0	0	-
Upper West Region	0.035	0.000	0.035***	0	0	-

The western region is the comparison group for the regions. ***p<0.01, ** p<0.05, * p<0.1.

Figure 3.3. Standardized bias across covariates before and after matching



3.8 Bibliography

Ara, F. (2019). Barriers to the Political Participation of Women : A Global Perspective. *Society & Change*, *XIII*(4), 7–22.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191.

Baser, O. (2006). Too much ado about propensity score models? Comparing methods of propensity score matching. *Value in Health*, *9*(6), 377-385. *https://core.ac.uk/download/pdf/82656794.pdf*

Beaman, L., Duflo, E., Pande, R., & Topalova, P. (2012). Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India. *Science (New York, N.Y.)*, *335*(6068), 582. https://doi.org/10.1126/SCIENCE.1212382.

Besley, T., Pande, R., Rahman, L., & Rao, V. (2004). The politics of public good provision: Evidence from Indian local governments. *Journal of the European Economic Association*, *2*(2-3), 416-426. https://www.jstor.org/stable/40004915

Boateng, J. S., & Kosi, I. (2015). Women's representation and participation in district assemblies in Ghana: Analysis of supply-side and demand-side framework. *International Journal of Scientific and Research Publications*, *5*(10), 1-6.

Blundell, R., & Costa-Dias, M. (2009). Alternative Approaches to Evaluation in Empirical Microeconomics: Journal of Human Resources. *Journal of Human Resources*.

Brookhart, M. A., Schneeweiss, S., Rothman, K. J., Glynn, R. J., Avorn, J., & Stürmer, T. (2006). Variable selection for propensity score models. *American journal of epidemiology*, *163*(12), 1149-1156.

Coalition of Domestic Election Observers (CODEO) (2015). Final Observation Report on the 2015 District Assembly Elections of Ghana. *Enhancing Citizen participation in the 2015 Local Government Elections: Deepening Ghana's Decentralization Process*. Available at https://www.codeoghana.org/assets/downloadables/2015%20CODEO%20District%20Assembly%20Elections%20in%20Ghana%20%20(1).pdf

Chattopadhyay, R., & Duflo, E. (2004). Women as policy makers: Evidence from a randomized policy experiment in India. In *Econometrica* (Vol. 72, Issue 5, pp. 1409–1443). https://doi.org/10.1111/j.1468-0262.2004.00539.x

Duflo, E. (2005). Why political reservations *Journal of the European Economic Association*, *3*(2-3), 668-678.*https://www.jstor.org/stable/40005009*

Franceschet, S., Piscopo, J. M., Bonner, M., Caminotti, M., Hinojosa, M., O'neill, B., & Wasserspring, L. (2008). Gender Quotas and Women's Substantive Representation: Lessons from Argentina. *Politics & Gender, 4*(3), 393–425.

https://doi.org/10.1017/S1743923X08000342

Gertler, P. J., Martinez, S., Premand, P., Rawlings, L. B., & Vermeersch, C. M. (2016). *Impact evaluation in practice*. World Bank Publications.

High-Pippert, A., & Comer, J. (1998). Female Empowerment: The Influence of Women Representing Women. *Faculty Publications: Political Science*. https://digitalcommons.unl.edu/poliscifacpub/2

Morgenroth, T., Ryan, M. K., & Peters, K. (2015). The motivational theory of role modeling: How role models influence role aspirants' goals. *Review of General Psychology, 19*(4), 465–483.

O'brien, D. Z., & Rickne, J. (2016). Gender quotas and women's political leadership. *American Political Science Review*, *110*(1), 112-126. https://www.jstor.org/stable/24809986

OECD (2020), *SIGI 2020 Regional Report for Latin America and the Caribbean*, Social Institutions and Gender Index, OECD Publishing, Paris, *https://doi.org/10.1787/cb7d45d1-en*.

Rosenbaum, P. R. (2010). *Design of observational studies* (Vol. 10). New York: Springer.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55. https://doi.org/10.1093/biomet/70.1.41

Rubin, D. B. (2007). The design versus the analysis of observational studies for causal effects: parallels with the design of randomized trials. *Statistics in medicine*, *26*(1), 20-36.

Sossou, M. A. (2011). We Do Not Enjoy Equal Political Rights: Ghanaian Women's Perceptions on Political Participation in Ghana. *Https://Doi.Org/10.1177/2158244011410715*, *1*(1), 1–9. https://doi.org/10.1177/2158244011410715

Stout, J. G., Dasgupta, N., Hunsinger, M., & McManus, M. A. (2011). STEMing the tide: using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology*, *100*(2), 255.

Stump, D. (2010). Combating sexist stereotypes in the media. *Report: Committee on Equal Opportunities for Women and Men.* Reference to committee: Doc. 11714, Reference 3492 of October 3rd, 2008. *https://pace.coe.int/pdf/c5016d3223e4b9bc658ba39a2604cc78cd56fa80602faf0de0328b255e9de1aa/doc.%2012267.pdf*

Thomas, M. (2013). Barriers to Women's Political Participation in Canada. *UNBLJ*, *64*, 218.

United Nations Women (UNWomen) (2018). *Revisiting Rwanda Five Years after Record-breaking Parliamentary Elections*. News and Events. https://www.unwomen.org/en/news/stories/2018/8/feature-rwanda-women-in-parliament

United Nations Women (UNWomen) (2021a). Women's representation in local government: A global analysis. *Hämtad, 27*, 2022-01. https://www.unwomen.org/sites/default/files/2022-01/Womens-representation-in-local-government-en.pdf

United Nations Women (UNWomen) (2021b). Facts and figures: Women's leadership and political participation. *Retrieved August, 27*, 2021.

Villa, J. M. (2016). diff: Simplifying the estimation of difference-in-differences treatment effects. *The Stata Journal*, *16*(1), 52-71. https://www.stata-journal.com/article.html?article=st0424