UNIVERSITY OF CAPE COAST

RELATIVE EFFECT OF FOOD AND CASH REMITTANCES ON

HOUSEHOLD FOOD SECURITY

JOSEPHINE BAAKO-AMPONSAH

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HOUSEHOLD FOOD SECURITY

BY

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ………………………… Date ………………………

Name: Josephine Baako-Amponsah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of the thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature………………...… Date ……………………

Name: Prof. Samuel Kobina Annim

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ABSTRACT

Considerable policy consensus concerning cash remittance as an operational model in the household food security policy dialogue has been established, yet, little knowledge base exists with regard to food remittances and its effect on food security. In view of this, the study focused on food remittance against the backdrop of remittance and food security. Specifically, the study examined spatial variability in food security outcomes across districts in Ghana, the impact of food remittance on household food security and the relative effect of food and cash remittance on household food security. Using the seventh round of the Ghana Living Standard Survey, the study employed spatial autocorrelation techniques to analyse the spatial dependence of food security outcomes, Propensity Score Matching, Endogenous Switching Regression and Instrumental Variable estimation to account for the issue of endogeneity associated with food remittance. The study disclosed significant spatial dependence and clustering of food security outcomes and revealed that aside most districts in northern Ghana experiencing high levels of food insecurity, some districts in the food dominance zone of the country relatively have high food insecurity outcome. The study revealed a significant positive impact of food remittance on food security. Again, an additional amount of food received reduces food insecurity by a greater magnitude relative to the effect from a cedi increase in the amount of cash received. In addition, food remittance was vital for food insecurity reduction in rural than in urban areas. The study recommended that policies targeted at remittance should be broadened to include strategies that enrich food transfers. Also, food transfers should be targeted at food insecure districts, particularly rural areas in such districts.

KEY WORDS

Food Remittance

Food Security

Food Consumption Score

Food Insecurity Experience Scale

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DEDICATION

To my parents: Janet Quaidoo and Kofi Baako; my uncle, Isaac Quaidoo and my

brothers.

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LIST OF ACRONYMS

ATT	Average Treatment Effect on the Treated
ESM	Endogenous Switching Model
FAD	Food Availability Decline
FAO	Food and Agriculture Organisation
FCS	Food Consumption Score
FIES	Food Insecurity Experience Scale
FSIN	Food Security Information Network
GH₵	Ghana Cedi
GLSS	Ghana Living Standard Survey
IFAD	International Fund for Agricultural Development
IV	Instrumental Variable
MDGs	Millennium Development Goals
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PSM	Propensity Score Matching
SDGs	Sustainable Development Goals
UN	United Nations
UNICEF	United Nations Children's Fund
VoH	Voices of the Hungry
WFP	World Food Programme
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

Background to the Study

The world has significantly succeeded in reducing poverty in accordance with the Millennium Development Goals (MDGs), however, food security and appropriate nutrition objective have not been well achieved (UN, 2015). Eradicating hunger while preserving global sustainable food security for all has been one of the greatest challenges for policymakers worldwide (FAO, IFAD, UNICEF, WFP & WHO, 2017). In view of this, the post-2015 development agenda emphasised food security in the Sustainable Development Goals (SDGs) (Battersby, 2017). The SDGs stressed the need for enhanced food security policies based on thorough, equitable, and viable food systems, essential for countries to achieve Goal 2; end hunger, achieve food security and improved nutrition and promote sustainable agriculture. Specifically, Goal 2.1 encourages countries to implement nationally appropriate food security approaches that aim at achieving zero hunger by 2030.

The concept of food security has been used widely as a measure of welfare and one of the conditions that must be achieved for one to be nutritionally secure and maintain good health. Food insecurity has been defined as the situation where members of a household become vulnerable when they do not have consistent and dependable access to nutritionally sufficient and socially acceptable food for healthy living (WFP, 2017; FAO, 2017). Food security has become a global problem especially due to the increasing number of people who stay food insecure (McGuire, 2015). Globally, 1 in 9 people signifying a total of 795 million were estimated to be food insecure and 815

million people hungry in 2016 (FAO *et al.*, 2017). In 2017, 124 million people faced food insecurity crises across 51 countries, an increase of 16 million from 2016 (FSIN, 2018). According to FAO, nearly 1 billion people suffer from chronic hunger with about 294.7 million food insecure people in Africa (FAO, 2015). In 2015, the State of Food Insecurity (SOFI) reported that the highest burden of hunger occurs in sub-Saharan Africa, where one in every four people (23.2 percent), of the population, are hungry. Recent reports reveal that the number of food insecure individuals in Sub-Sahara Africa increased from 176 million in 1990 and 1992 to 220 million in 2014–2016 (FAO, 2017). In Ghana, FAO revealed that approximately 1.2 million individuals, representing 5 percent of the population were food insecure and 2 million people were projected to be susceptible to food insecurity shock (FAO, 2016). Currently, the World Food Program (WFP) estimated 99,110 people of the Ghanaian population to be food insecure for the first quarter of 2018 (WFP, 2019).

Drawing from the numbers of the insecure population across the globe, candid concern worth perceiving is how these figures affect economic performance, particularly its effect on livelihood. Thus, the problems associated with food insecurity has been identified to be multidimensional given its implications on multiple aspects of individuals, households, and the nation; emphatically it influences different dimensions of human development; education, health, nutrition, among others (Burchi & De Muro, 2012). Intuitively, food insecurity causes people to compromise not only the food they eat but also behaviours (WFP, 2015). The foregoing suggests that food insecurity undermine not just the health and productivity of people, but also thwarts social and economic development given its adverse bearing on the

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various aspects of development. Food insecurity effect can be either acute or chronic, depending on the root of the problem, whether short-term or long-term streaming from constraint by diverse economic, environmental, political, and social factors (Coates, 2013). Given the varied effects coupled with high rates of global food insecure population, food security has raised key concern on countries' policy agenda (Maxwell, Coates, & Vaitla, 2013) and triggered growing interest among developers and social researchers, research and academic institutions; to develop measures and considerate policy targets that are imperative for reducing this impact and also achievable SDG 2 (FAO *et al.*, 2017).

The WFP (2015) argued that the food insecurity problem is profoundly inclined by availability, access, utilisation and stability of food. In this regard, food is seen as the most significant, and perhaps the only element of food security (Burchi & De Muro, 2012). In view of this, the United Nations specified access to adequate food and freedom from hunger as a basic human right (FAO, 2015). With the growing knowledge on the conceptualisation of food as a basic human right coupled with the United Nations policy dialogue, there have been considerable efforts among nations over the decades to achieve food security. Most countries have put constructive policies forward to address food insecurity; most of which focus on weather variability, price fluctuations, income and purchasing power of household population, diet quality and diversity, among others. Notwithstanding these exertions witnessed over the last decade, the 2018 State of the Food Security and Nutrition in the World (SOFI) published by the FAO, reported rising food insecurity and hunger level, with about 821 million people having faced food insecurity in 2017 worldwide. The

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pertinent question still remains as to how and why most countries' food insecurity status is high given the numerous interventions to tackle this phenomenon.

Conferring the afore-mentioned issue, Burchi, Scarlato and d'Agostino, (2016) argued that most countries' food security agenda places food production at the core of its attempts to resolve the emergent problem of food insecurity, disregarding crucial political, social, and cultural factors that perpetuate food insecurity (Coates, 2013). Nevertheless, FAO (2015) argued that availability of food has prominently improved over the past half-century and with that, the amount of food needed to feed the world's population is already produced; hence focusing on agricultural production would not provide a modest tactic to the food insecurity discourse. Holt-Gimenez *et al.*, 2012 debated further that with the available food, measures focused on food production would be too lean an approach to address this multi-dimensional problem of food insecurity, given the widespread of hunger, malnutrition, and food insecurity within countries. Consequently, they argued that the problem of food insecurity is basically a distributional concern; who needs the available food, when they need it and how they get steady and proper access to food. This presupposes an integrated approach to attaining food security that addresses the resilience strategy of all households' types.

The foregoing highlights the need for appropriate policy pathways where the focus is not solely on the end goal, but also on the means used to achieve it. The noblest endeavour to solve world food insecurity via producing more food according to available evidence should be revised. This does not mean that policies directed at enhancing food production should not be implemented,

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however, the relationship between acquisition and food insecurity status should be recognised especially when addressing the access dimension of food security. People are food insecure not due to the absence of food availability, but because people are unable to access sufficient food (Holt-Gimenez *et al.*, 2012). Put bluntly, those with little or no resource mostly remain food insecure. Thus, food security outcomes are expected to deteriorate among the poorest households with mostly limited coping strategies (Burchi & De Muro, 2012). In view of this, vulnerable households may require livelihood support to prevent household food deficits and going hungry. This inevitably leads to altruistic theme whereby food insecurity is tackled by offering more charitable contributions of food or cash for food production or consumption, or better still finding more friendly ways to ensure equitable distribution of food.

Potential interventions and support programs targeting vulnerable households have witnessed remarkable attention in addressing food insecurity. Food assistance recently has become part of a policy mix that advances social wellbeing in general and has proven crucial in tackling world hunger, especially in emergency situations. Notably, WFP partners with most African Governments and other agencies such as NGOs to provide food assistance, particularly in response to humanitarian crises to obviate emergency rates of unfavourable coping mechanisms, attain food security and enhance livelihoods. Likewise, non-emergency food assistance such as school lunch has been steadily gaining prominence in the discourse of food security. Correspondingly, countries across the globe specifically provide social protection and safety nets, such as cash transfer programmes to support vulnerable groups. With these transfers, WHO and UNICEF (2017) revealed that a large amount of the cash

received by recipient household is mostly spent on food, regardless of the conditionality of transfer. This evidence stresses on the importance of food to household livelihood and presupposes that a prerequisite for the vulnerable and poor are improving their food needs. Precisely, the government of Ghana has also established several social protection and safety nets policies such as the Ghana School Feeding Programme (GSFP) among others, as a form of household survival strategies to support vulnerable households. Steadily, such interventions have been used to attain food security and enhance livelihoods by boosting strengthening resilience, supporting education goals and building national capacities (WFP, 2017).

Moving forward, an essential fact worth perceiving is that altruistic behaviour is not only by government and international organisations but also individuals within countries engage in such deeds. For more than a century, people, not necessarily vulnerable, have been receiving transfer both in cash and in-kind from relatives, friends and others (Adams Jr, 2011), which leverage a significant impact on the welfare and vital to reach the SDGs (Crush & Caesar, 2017). Evidence suggests that remittances play a critical role in meeting the short-term food needs of people, to resume livelihoods by improving spending on food and augmenting food consumption; thereby contributing to household food security (Crush & Frayne, 2010; Crush, 2013; Regmi & Paudel, 2017). Remittance has been well-defined to include both cash and in-kind goods flows (Adams Jr, 2011; Yang, 2011), however, empirical evidence mostly focused on the use of cash transfer. Clemens, Özden and Rapoport (2014) revealed that cash remittances are not the only way people contribute to household food security, food as part of in-kind remittance is likewise crucial. Advancing household food

security, remittance, both cash and food have been underlined as potential pathways in examining household food security schemes (Crush & Caeser, 2017); yet, the evidence does not concurrently consider food remittance when analysing the effect of remittance on household food security.

Notably, evidence across the globe provides a solid stance in favour of remittance as a driver for household food security (Ratha, 2016). The argument has been that most friends and relatives remit to other households which Kuuire, Mkandawire, Arku, and Luginaah (2013) revealed to strengthen social links among households. Likewise, across the African continent, there is substantial evidence of massive transfer of food (Crush & Ceaser, 2017; Tawodzera & Crush, 2016; Kuuire, *et al.*, 2013). During the 1983 famine in Ghana, historical evidence reveals the transfer of food among households, as a crucial coping strategy particularly, for urban households. Given the significant volume transfer of food within countries across the continent, Crush and Caesar (2017) revealed a new perspective to food security discourse with food remittance as a relevant strategy for maintaining food security. Hence, it is of interest to analyse remittances; food and cash, and household food security in Ghana.

Statement of Problem

Remittance has received substantial consideration over the past decade in providing evidence-based support for policymaking. More particularly, remittances have been proven to provide a bolster for household welfare across the globe. It is evident that remittances increase households' ability to access food, boost their livelihood and enhance their nutritional status (Ratha, 2016; Generoso, 2015; Regmi & Paudel, 2017). Akobeng (2017) revealed that

Ghanaians treat remittances as any other source of revenue and this has a significant effect on their household consumption. Correspondingly, the evidence discloses that a substantial part of cash remittances is spent on food rather than investing in productive activities (Adams Jr & Cuecuecha 2013; Generoso, 2015; Regmi & Paudel, 2017), emphasising food as a crucial element of food security. The connexion amid remittances and food security tend to be narrowed mostly on the extensive use of cash remittances on food purchases (Crush & Caesar, 2017), disregarding the impact of the other forms of remittance on household food security. Thus, for one to focus solely on cash remittances in probing food security is to miss an alternative crucial element of the relationship between other forms of remittance and food security. Therefore, it is crucial to concurrently analyse the receipts of food remittances and how this affects their household food security status.

Moreover, the evolving lessons on rural-urban linkages have established a strong connection between food remittances and food security. Nevertheless, available evidence basically investigates food flows that tend to focus mostly on urban food security. To further explore the nature of urban and rural linkages, it is imperative to focus on the rural and urban scopes of food remitting and its effect on household food security. The study seeks to further examine food remittance and variations in rural and urban household food security. The study provides extension by intensifying the geographic and thematic scope of food security, thus, the study will consider spatial variability of food security to ascertain food insecurity experience areas in Ghana.

Purpose of the Study

The main objective of this study is to examine the effect of food remittance on food security in Ghana.

Research Objectives

Specifically, the study attempts to:

1. determine spatial variability of food security across districts in Ghana.

2. examine the impact of food remittances on household food security.

3. estimate the relative effect of food and cash remittance on household food security.

Research Hypotheses

1. H_0: there is no variation in food security status across districts in Ghana.

    H_a: there is a significant variation in food security status across districts in Ghana.

2. H_0: food remittance-receiving households are less food secure compared to non-recipient households.

    H_a: food remittance-receiving households are more food secure compared to non-recipient households.

3. H_0: Food remittance has no effect on household food security compared to cash remittance.

    H_a: Food remittance has a greater effect on household food security than cash remittance.

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Significance of the Study

The UN Zero Hunger Challenge, an invitation to action has called for a paradigm shift in countries' policy agenda. One of the fundamental proposals of this policy requires comprehensive efforts to ensure people's right to adequate and sustainable food to achieve SDG 2. Given the multifaceted system of networks incorporating rural and urban dimensions, food remitting cannot be treated in seclusion. This study seeks to fill the current knowledge gaps by incorporating food remittance to the policy dialogue. This study is particularly significant in light of incorporating the effect of food remittance in food security discourse in Ghana. Likewise, transforming food security outcomes into geographical information would guide decision making to pinpoint vulnerable areas to food insecurity and direct appropriate intervention. Thus, the study will create a platform for a new policy proposal by drawing attention to the significance of food remittances in strengthening food security for urban and rural households. This study will likewise contribute to the existing literature by employing a robust methodology for the understanding of food security outcomes in Ghana.

Delimitation of the Study

The study explored the socio-economic and demographic factors; deduced from the empirical and theoretical literature, that affects household food security outcomes in Ghana with particular emphasis on food remittance. The study employed a quantitative design which allows for the use of nationally representative surveys (GLSS 7) and the application of appropriate techniques to engender the realisation of the objectives of the study. The study used Food

Insecurity Experience scale, constructed by employing PCA and Food Consumption Score, as measures of food security. Food security outcomes were spatially explored to appreciate food security status across 216 districts in Ghana. To evaluate the impact of food remittance on food security, propensity score matching and endogenous switching techniques were used to solve of self-selectivity and unobserved heterogeneity respectively. The study also employed Instrumental Variable (IV) estimation to overcome the biasness and inconsistency of OLS technique resulting from the problem of endogeneity whiles analysing the effect of the amount of food received on household food security outcomes.

Limitations of the Study

Crush and Caesar (2017) observed different kinds of food households receive which the study failed to consider whiles analysing food remittance. The 2017 Ghana Living Standard Survey (GLSS) does not have data on types of food received. Hence these variables, which may provide some relevant information on how the type of food received enhances household dietary diversity, were not included in this study. Likewise, the study did not consider the various modes of food transfer given the data used. Also, the study focused on household food insecurity experience and food consumption score without acknowledging intra-household variation in food security outcome across other food security measures. Although the analysis provides suggestive evidence linking food security and spatial factors at the district level, the study did not analyse causal factors of food security across space, as a result of selection bias,

which makes it difficult to establish a causal connection between food received and food security.

Organisation of the study

Chapter one deals with the background of the study, statement of the problem, the objectives of the study, hypotheses, significance of the study, scope and the organisation of the study. Chapter Two presents a review of relevant literature, both theoretical and empirical theory related to the study. The third chapter takes into account the methods and procedures; analytical tools and techniques for the empirical analysis. These include the theoretical and empirical model specification and data used. Chapter four provides data analysis, presentation and discussion of results with reference to the literature. Chapter five gives a summary of the study, conclusions and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The core of this Chapter is to survey existing theoretical and empirical literature that relates to the main areas of the study; household food security and remittances. The essence of this chapter is to place the current study into a broader perspective. The Chapter is broadly divided into two core sections. Whereas the first section examines the theoretical literature that underpins the study, the second focuses on the existing empirical studies.

Theoretical Review

This section situates the argument behind the study within a theoretical context. The theoretical reflection focuses on the concepts and theories supporting the normative choices in the design of food security measures and remittances. The source for theoretical considerations is essential, particularly in the context of understanding food security. Concerning the theoretical approaches, the section reviews literature in the following areas: theoretical issues in the conceptualisation of food security; theoretical issues in the measurement of food security; Entitlement Theory.

Theoretical Issues in the Conceptualisation of Food Security

A decade and a half have witnessed the rise of food security as a policy tool intended to achieve the SDGs (FAO *et al.*, 2017). The rising food insecure population across the globe has raised concerns on the post-2015 development agenda to highlight measures that stimulate hunger and food insecurity reduction among countries. Food security has been reviewed as

multidimensional, ranging from global, through to the individual level; making the concept a complex phenomenon especially given its diverse determinants and outcomes (FAO, 2015). The complexity of food security required a detailed and acceptable definition to reflect its various dimensions.

The 1996 World Food Summit (WFS) conceptualised food security as ''a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life'' (FAO, 1996). Thereby, food insecurity refers to the condition when people do not have enough food to satisfy hunger or anxious about not having enough food due to economic and social deprivation; not voluntary fasting or dieting or for other reasons (FAO, 2017). According to FAO, understanding food insecurity is imperative for framing its associated problems and developing interventions to address the phenomenon. In this regard, the FAO (1996) defined food security that focuses on three distinctive but interrelated components as key pillars of food security: availability of food, accessibility of food and utilisation of food. Yet, the evolution of the concept urged the FAO to include the stability dimension of food security to the underlined existing three pillars, to assess the constancy of food to households (FAO, 2015). Debatably, inadequacies attributed to one or more of the four pillars pose a threat to one's food security status.

Availability

The availability pillar hinges on adequate amounts of food from either household production, local output, imports or food aid. The availability component incorporates a combination of such elements as agriculture production, national policies, the functioning of global markets, and the state of

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the physio-economic infrastructure (FAO, IFAD & WFP 2015). The world, according to FAO, IFAD and WFP (2015), has witnessed significant improvement in agricultural production over the years, making food available across the globe. This insight provides a basis for FAO to argue that availability of food is no longer a threat to food security, which further calls for significant modification in the explanation of food security to take into account distribution of resources. This further proposes shifting from food production of adequate food stocks to one's ability to acquire food. Doubtfully, availability is of little relevance if people do not possess purchasing ability to buy available food for their household consumption and hence, food insecurity would linger given that the available food is not effectively distributed among the population.

Access

Food security dialogue has evolved beyond household food production to examine household ability in the acquisition and allocation resource and food. This progress highlights the access pillar of food security. The access component focus on having adequate resource to obtain suitable foods for a nutritious diet (Swindale & Bilinsky, 2006a). Access to food is defined to include household's available income, individuals to access social support and prices of food. According to Barrett (2002), food access is constrained by available resources and sociocultural, economic and political reasons; which Sen (1981) explained to be the consequences of poverty. The poverty concept in relation to food insecurity poses a vicious cycle problem. The paradoxical phenomenon of poverty and food insecurity have been articulated in literature, however, suspiciously focused on rural setting (Frayne *et al.*, 2010; Crush & Caesar, 2017). Nevertheless, beyond economic affordability, physical access to

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food, enhanced by the presence of operative infrastructure and market chains is vital to support food distribution and pricing (Barrett, 2010; Coates, 2013). Thus, the access dimension involves economic, physical, and social factors that affect a household's ability to obtain food. In view of this, FAO encouraged policies aimed at fostering access to food and productive resources that are deemed beneficial to livelihood; by providing apt, sufficient food and livelihood assistance through transfer and infrastructure modalities based on a thorough analysis of local risks and needs of the most vulnerable group.

Utilisation

Food security continued to advance as concerns emerged over unequal access and distribution of food among people. FAO revealed that improving food access and availability alone is not enough to ensure individual food security, hence, stepped up the utilisation dimension. Utilisation measures one's ability to acquire and use sufficient food that contains essential nutrients for a given period. Conjure, people may have enough food to feel satisfied, but the diet may have inadequate levels of micronutrients (Swindale & Bilinsky, 2006a). Food utilisation comprises socio-economic and biological dimension; where the socio-economic element pivots on intra-household dynamics with the sharing of food within the household, conditioned on who eats what among the household members, and the biological dimension focuses on the human body's ability to take and transform food into daily energy or store it for future energy requirements; hinging on the organic make-up of the individual. Utilisation has further been explained to include issues of feeding practices, food preparation, which Sassi (2015) argued to enhance sufficient nutrient intake by individuals. Explicitly, utilisation is considered as a third component on the basis that food

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acquisition is essential, but not sufficient for warranting household food security (Capone, Bilali, Debs, Cardone & Driouech, 2014).

Stability

Finally, the FAO considered stability as the fourth domain of food security, in recognition that shocks in the other three pillar need to the accounted for to ensure food security. Thus, stability reflects the reliability with which the requirements of the other three pillars are met (FAO, 2015). The expression "at all times" in the FAO definition for food security highlights the stability component of food security. Coates (2013) revealed that food security status often varies across time due to irregular shocks such as weather events, conflict, among others, which may lead households to experience food insecurity shocks. Ideally, the stability pillar emphasises on how households consistently accumulate sufficient food and their capacity to adjust difficult times given coping strategies.

Theoretical Issues in the Measurement of Food Security

Measurement, according to Kaplan (2017) is essential in the process of inquiry and allows standardisation with the application of techniques. To assist with the verification, prediction, and explanation of food security, measurement has advanced over the period to focus on food availability, access, utilisation and stability pillars and a mix of these domains. Likewise, food security measures have evolved to incorporate broader issues related to socioeconomic, physiological as well as psychological deprivation. The intricacy and contextualisation of such features of food security have led to reviewed methods for developing food security measurement tools. Significant efforts have been in place for centuries to define the best suite of measures for assessing food

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security at national, regional, household and individual level (Barrett, 2010). Measures widely used to assess food security include; household expenditure surveys, dietary intake assessment, experience-based food insecurity measurement scales and anthropometry.

The core food security measure of FAO often uses country-level data on mostly food balance sheet for measuring food availability (Jacobs & Sumner, 2002). The FAO method considers the Prevalence of Undernourishment (UoP) indicator which calculates food availability by estimating calories per capita and energy intake-aggregated food supply and food utilisation, to analyse food shortages and surpluses. FAO with other organisations further sets additional indicators such as Global Food Security Index (GFSI), Global Hunger Index (GHI), Food Security Phase Classification (IPC), to offer a complimentary assessment to the distinctions in dietary energy supply and malnutrition measures (Nigam, 2018). These tools assess available national food supplies to inform intervention planning, however, they do not highlight household measure and determinants of food access (Webb *et al.*, 2006).

Screening the density of food security challenge, Coates, Swindale and Bilinsky (2007) revealed the need to include household measures in the valuation of food security to enable one analyse the variations in household food security, by capturing other pillars particularly the access pillar of food security in more details. This argument brought to light Household income (consumption) and expenditure surveys, dietary diversity and Food insecurity experience-based measurement scales. The Household Income and Expenditure Scale (HIES) poses questions on the amount of money that household spend on food for a defined period (Swindale & Bilinsky, 2006a). It includes foods

household members receive in the form of transfer and foods grown for household consumption. HIES basically help access household socioeconomic status and ascertain households susceptible to food insecurity given their income status. Nevertheless, this measure does not certainly look at the amount of food consumed within the specified timeframe and individual consumption needed for an accurate dietary intake assessment.

In order to address some of the issues with HIES, the USAID developed the dietary diversity indicator for measuring household food access. Dietary diversity tool captures the distinct food types that individuals consume and the frequency with which they eat them for a specified period. It involves weighing and scoring of these food groups to signify the diversity of intake. (Swindale & Bilinsky, 2006b). The instruments used in measuring dietary diversity include the Food Consumption Score (FCS) and Household Dietary Diversity Scale (HDDS). The WFP used the Food Consumption Score (FCS) indicator to assess the link between dietary diversity and household food access by capturing the frequency (quantity) dimensions of food consumption and provides an acceptable proxy to measure dietary diversity (quality) at the household level. On the other side, HDDS developed by the Food and Nutrition Technical Assistance (FANTA) Project weights the response on the consumption of food groups from individuals responsible for household food preparation (Kennedy, Ballard & Dop, 2011). Although, both FCS and HDDS capture quality and diversity of household food consumption, they vary in the composition and classification of food groups, the weighting of food groups, recall period and the cutoff points for describing food-insecure households (Coates, 2013). Nonetheless, these measures do not capture periodic changes and intra-

household food consumption and cultural diversity. Faber, Schwabe and Drimie (2009) argued that these measures do not provide an exclusive classification of dietary diversity for different setting based on cultural preferences.

Development analysts and practitioners revealed that most of the household-level measures of food access discussed are technically tough, data-intensive, and expensive to collect. In view of this, international agencies (IFAD, WFP, FAO) developed an idyllic method that represents a measure of food security centred on experience-based food insecurity scales. Distinct from the other approaches that measure household food access, experience-based approaches for measuring household food access seek to measure household behaviours and food security experiences (Leroy *et al.*, 2015). Experience-based measures of food security pose questions that reflect cultural or peculiar values of deficiency, by capturing psychosocial features related with anxiety or uncertainty concerning households' ability to procure adequate food due to physio-economic constraints (Webb *et al.*, 2006). Experience-based household food security scales were based on an ethnographic Radimer questionnaire which provided the theoretical construct for the U.S. Household Food Security Survey Module (US HFSSM); a qualitative measure of food security comprising 18-questions that allow households to express their subjective experiences of the four pillars of food security (Deitchler, Ballard, Swindale & Coates, 2010).

An additional measure aimed at understanding the experience of household food security includes Household Food Insecurity Access Scale (HFIAS), Household Food Insecurity Access Prevalence (HFIAP) and Household Hunger Scale. The FANTA-HFIAS was intended to capture household behaviours of deficient quality and quantity, besides anxiety and

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uncertainty about household food supply (Swindale & Bilinsky, 2006b). Coates, Swindle and Bilinsky (2007) extended this measure to include the Household Food Insecurity Access Prevalence (HFIAP) to evaluate the degree of insecurity; food secure, mild, moderate and severe food insecure. In response to an indicator to complement/supplement the HFIAS, FANTA recommended HHS which considers insufficiency of household food supply and intake (Leroy *et al.*, 2015). Deitchler *et al.* (2010) argued that HHS focus on hunger rather than food security, hence, restricts the measurement potential of the HHS as a food security indicator.

Advancing the frontiers of food security measures, the UN FAO-Voices of the Hungry project (VoH) came up with the Food Insecurity Experience Scale (FIES), a multidimensional and cross-cultural tool to assess food security (Cafiero *et al.*, 2016). The challenges of other measures motivated the development of a more robust measure using item response theory. FIES is a food insecurity severity experience matrix that relies on responses to questions about their access to adequate food, based on a conversant paradigm of food insecurity experience which comprises three domains: anxiety, changes in food quality and quantity (Cafiero *et al.*, 2016). Thus, the items on the scale are based on respondents' own perceptions regarding the adequacy of their food consumption, rather than being weighted and scored by the researcher (WFP, 2015). This helps to evaluate the prevalence of people facing food insecurity at various levels. With FIES, a household member response to the household food insecurity experience which does not necessarily embody the perception of all household members. Experienced-based indicators have been argued to be subjective in nature and can be easily manipulated, especially in anticipation for

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assistance and must be critically analysed whilst adopting it (Cafiero *et al.*, 2016).

Likewise, to address the challenge of food insecurity that results from displacement and crises, measures centred on participatory adaptation such as Coping Strategies Index (CSI) and Household Economy Approach (HEA) have been developed (Maxwell, Caldwell & Langworthy, 2008). The CSI was developed by the WFP, to measure household adjustments vis-à-vis consumption and income changes, expenditure reduction during crises. A reduced version has been established over the period to measure the less-severe coping behaviour, although, it does not offer inclusive information on the kind of food-insecure households (Jones, Ngure, Pelto & Young, 2013). Similarly, the HEA developed by the humanitarian society, Save the Children Fund in partnership with the FAO provided a participatory approach to assess livelihood vulnerabilities. Both CSI and HEA propose a set of evaluation procedures rather than household survey data to mostly predict the effect of potential risks on the household food security by measuring the household coping strategy (Seaman, Sawdon, Acidri & Petty, 2014).

Adjoining food utilisation pillar-which encompasses the allocation of food within households, it is necessary to appreciate the tool for measuring the distribution of food within households. The food utilisation domain hereby relies on anthropometric measures to capture food intake. Anthropometric measures evaluate the effect of food insecurity and health status in relation to the size, weight, body proportions and eventually, the composition of the human body. These features combined with an individual's age and sex, are compared alongside population standards in order to generate anthropometric indices that

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may reflect ones' nutritional status. This measure permits a more accurate appraisal of intra-household food allocation and usage (Ahmadi *et al.*, 2018).

Undoubtedly, conceptualisations, as well as the indicators of food security, have indeed advanced beyond national-level food supplies, to measure food security in all of its dimensions. Diversity in the measurement approaches has been thoughtful and systematic; essential for more efficient and effective policy guidelines**.** All these metrics have inherent strengths and limitations and hence, one must acknowledge these trade-offs with their usage. Measurement of food security has evolved to include many measures; however, challenges still remain in validating measures the countless approaches in the conceptualisation of food security (Jones *et al.*, 2013). Exemplifying this view, household instead of individual-level data are mostly collected and this does not allow for intra-household allocation assessment; a central concept to appreciate the utilisation component of food security. Similarly, Coates (2013) argued that measures on diet quality and safety are often vague from food security indicators. Regardless, the various approaches have authenticated the conceptualisation of the phenomenon over time and have somewhat ensured consistent understanding of the complex food security phenomenon across the globe.

Food Availability Decline (FAD) Approach

The FAD approach dominated theoretical illustrative framework of food security until the year 1980. FAD relied on the proposition that reducing the availability of food is the root cause of famine. Thus, the approach regarded famine as deficiencies in food supplies per capita. FAD proponents argued that factors that hinder food production are the root causes of famine, and further

claimed that natural factors such as drought, are central in the disruption of food production (Tolossa, 2002). Thus, the FAD theoretical framework centred shortages of food supplies as a result of natural factors or demographic factors (Lin & Yang, 2000). Hence, FAD assessment of hunger does not necessarily result from lack of market supply, but inadequacies in resources to produce them. Ideally, FAD is fixated on the supply side of food acquisition without considering the causal mechanism which ultimately explains why and how certain classes become prey to famine. More specifically, FAD failed to explain why hunger may arise in the absence of food shortage, thus, disregarding the component of access to food in the hunger discourse. Preferably, FAD could be a necessary condition but in specific cases, not ample.

Entitlement Theory

The entitlement theory unlocks an additional perspective to the food security discourse. Sen and his associates extended the grasp of the entitlement approach, which emphasised individuals' command over food from its initial birth of famine and highlighted the essence of food access in defining food security. Sen (1982) in his article "Poverty and Famines: An Essay on Entitlement and Deprivation," brought to forefront insight that changed the perception of famine by incorporating historical examples of food deprivation in countries. Drawing from the traditional famine analysis which classifies food shortage as the primary cause of famine, Sen argued that people are hungry primarily due to lack of ability to access food, and not the absence of food availability per se. Counterbalancing the Food Availability Decline (FAD) Approach, Sen decisively shifted food insecurity awareness from the supply side to the demand side by emphasising access to food rather than the availability of

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food. Sen denied the usefulness of the FAD approach in a modern context based on a plurality of causes and asymmetry of impact. Synthesising both approaches, FAD concentrated collectively on food availability, while the entitlement approach focused on disaggregation of individual resources.

Sen built his framework upon three conceptual consortiums; the endowment set, the entitlement-mapping and the entitlement set. He defined the endowment set as the combination of resources legitimately owned by an individual. Thus, whatever a person holds as resources, both tangible and intangible should imitate reputable social standards, and not just what is endorsed by the state. For the entitlement set, Sen defined as the possible combinations of alternative commodity bundles that a person can rightfully attain using the resources from his endowment set. This concept comprises the usage of resource in a different way specifically conditioned on the taste and preference of a person. With this, the entitlement mapping (E-mapping), explains the connection between the endowment set and the entitlement. Instinctively, E-mapping relates to how one can convert the endowment set into goods and services in the entitlement set. This concept is further explained to incorporate three components: a production component, exchange component and transfer component.

The philosophical ideology behind the Sen approach is that famine is triggered by entitlement failure. Thus, when a person entitlement set is not sufficient for him to overcome hunger. Distinctively, entitlement failure can be sourced from endowment loss, production failure, exchange failure, and transfer failure. A crucial insight Sen (1982) emphasised is the fact that people can be food insecure even if food supplies are ample and markets are functioning well.

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Collectively, there must be enough food available, and households must be capable to acquire, not just temporary but overtime. Perhaps, the most appreciated contribution of the entitlement approach is its analytical shifts from food supplies and the inability of people to acquire food, to enlighten the aspect of food access, regardless of food availability. Illustrative to this thoughtful shift, the FAO (1983) revised food security definition adopted in 1974 World Food Summit that emphasised availability, to reflect the concept of both availability and stable access.

The entitlement approach, although insightful, has attracted some criticism over the period. Some critiques questioned its failure to integrate social and political issues that contribute to the weakening of food security and reprieve entitlement and non-legal transfers (Shadach *et al.*, 2018; Devereux, 2001; Qudrat-I Elahi, 2005). According to Devereux (2001), Sen favoured economic aspects by focusing on proximate reasons of hunger such as money, above socio-political and environmental factors which plays a critical role even in terms of a person ability access to food. Further, Devereux argued that Sen's critique of FAD is scanty because hypothetical, supply and demand forces matter in the general equilibrium analysis and hence, called for the use of the general equilibrium model. Likewise, Sen's idea of exchange entitlement has been argued to be inconsistent since it overlooked voluntary exchange, rendering it inclusion in the opportunity menu to attain food, inconclusive. Integrating Sen's ideological concept, the study argues that transfers (cash or food) could supplement E-mapping set when analysing the pillars of food security. Drawing from the aforementioned, the study seeks to synthesise the approach with the inherent concerns, drawing from the conceptualisation of

food security, by incorporating the ability of households to acquire food from sources such as transfers and how this affects their household food security status.

Conceptual Overview of Remittance

Remittances have received substantial consideration over the past decade due to the assessed impact on development. The World Bank (2018) argued that remittances contributed to economic growth by boosting consumption, investment demands and savings. Estimates of remittance flow to developing nations indicate an upsurge from the previous decade at an average rate of 4.2 percent yearly, from USD 296 billion in 2007 to USD 445 billion in 2016, with an estimate of USD 466 billion in 2017(World Bank, 2018). The World Bank (2018) estimated that international remittances to these areas increased by 8.5 per cent in 2017 from the previous year, and further estimated it to grow by 4.1 percent (USD 485 billion) in 2018. Although the African region remains the costly place to send cash, receipt within the region is high across the globe (World Bank, 2017). The World Bank (2018) revealed $38.4 billion migrant remittances in Sub Saharan Africa with the largest remittance recipients being Nigeria ($21.9 billion), followed by Senegal ($2.2 billion), and Ghana ($2.2 billion) in 2017- this mirrors only official migrant remittances receipts. For Ghana, the country in 2016 received cash remittances that amounted to 20 percent of GDP (World Bank, 2017). Prioritisation of remittances as a development tool, this evidence considers the large and increasing flow of international remittances, leaving little room for internal remittance.

McKay and Deshingkar (2014) argued that internal remittance may significantly surpass cross-border cash remittances, however, focused is dwelt

on the effect of international flows. Thus, the conceptualisation of remittance mostly ignores internal flow, especially when analysing the impact of remittances. Building a better rural-urban linkage, the internal transfer has proven worthy in strengthening household livelihoods (Crush & Caeser, 2017; Adam, 2011). People are mostly motivated to remit to others as a form of relief or to reflect risk sharing (Regmi & Paudel, 2017) to improve the wellbeing of their others. Motivation to remit draws from the importance of altruism and self-interest-based exchange. Bates (2000) resonated Lucas and Stark altruism framework and self-interest motive which forms part of coinsurance plan to transfer to include a self-enforcing obligation for social interactions. Altruism, according to Oluwafemi and Ayandibu (2014) is influenced by a person's income and his attachment to the recipient. According to the self-interest motive, mutuality underlies remittance flows where transfers act as repayment.

On the impact of remittance, Ratha (2016) draws from two dominant perspectives; neo-liberal-functionalist persuasion and historical-structuralist perspective. Whereas the Neo-Liberal Functionalist approach considers remittances to be beneficial at all levels, the historical-structuralist view cogitates remittance to be responsible for dependence among people. Recent evidence embraces this controversial stance with one side arguing that remittances contribute to household poverty reduction; although the overall effect is equivocal in literature, and also use to soothe household food consumption during financial socks (Combes, Ebeke, Maurel, & Yogo, 2014) whereas the other side stress on the social inequality and differentiation (Feleke, Kilmer & Gladwin, 2003). The argument still remains whether remittances have positive or otherwise effect on recipients.

The International Organisation for Migration (IOM) in 2006 defined remittance to be limited to money flows associated with migration which constitutes cash sent by migrants or immigrants back home to their families in the form of aid or financial assistance. A noticeable degree of remittance across the globe has been attributed to migration; where people move from their area of reason to other places mostly for economic reasons (Regmi, Paudel & Williams, 2014). Notably, remittances are not necessarily sent by migrants and thus, may occur outside the migration context. This presupposes that although IOM definition holds, it is limited in scope since resource flow is not solely attributed to migration. It is expedient to note that individuals, as well as organisations within the same settings, also transfer resources among themselves. Likewise, Adams (2011) and Yang (2011) defined remittance to include both cash and in-kind goods flows; a notion disregarded in the IOM definition. Here, non-financial materials such as gifts transfers are deemed crucial in examining remittances (Quartey, 2006; Tawodzera, 2012), however, evidence tend to focus more on cash remittance and its effect on household welfare, disregarding the other forms of remittance such as food. Evoking the in-kind feature of remittance, food remitting has equally been established in the African literature. Evidence on food remittance suggests that food transfers represent a means for offsetting food shortages and maintaining food security (Djurfeldt, 2015; Djurfeldt & Wambugu, 2011). A point worth noting is that food remittance cannot be treated in isolation when analysing the impact of remittances (Crush, 2013), and hence, must be given critical attention. Preferably, food flows should be reviewed extensively alongside with cash

transfers, and should not be ignored when analysing the importance of remittance.

Empirical Review

This section reviews the literature on food security, taking into cognisance their methods, determinants, and other related themes. In undertaking the reviews within the scope of the main issues, the study synthesises global empirical studies with evidence from developing countries and Ghana.

Determinants of food security are one of the most empirically investigated food security-related themes. Several empirics of the determinants of household food security focus on socio-demographic and economic characteristics of individuals and households, and how specific variable affects household food security status. Some factors cut across all dimension of food security whereas others are attributed to specific pillars. Distinct factors make one household food secure and the other insecure with regards to the dimension of food security one is considering. Obviously, determinants of food security assert to the various pillars and the measurement of food security.

Exploring household food security determinants, Nkegbe, Abu and Issahaku (2017) analysed food security in the Savannah Accelerated Development Authority (SADA) zone of Ghana by applying an ordered probit with household hunger scale approach. The study revealed that households in the Upper West and Upper East regions are food insecure compared those in Northern and Brong Ahafo regions. The study revealed such factors as education, means of transport, farm mechanised equipment, agricultural yield,

ownership of livestock, food consumption expenditure, prompting variation in food security status across SADA region. The findings confirmed some factors that Maxwell, Coates and Vaitla (2013) identified to jointly distinguish rural food security status in the Tigray region using Household Income, Consumption and Expenditure Survey (HICES) and Welfare Monitoring Survey. The discriminant function employed in the study was resourceful in discriminating households based on the eight predictors which hierarchical ranges from distance to input source followed by household size, through to the educational level of the household head; with 79.7 percent of the households correctly classified. The implication of these findings is that agricultural productivity substantiates an intermediate stance for food security and hence issues relating to its production should be given attention. Darfour and Rosentrater (2016) supported this stance and argued that agricultural productivity is key to food security in Ghana after reviewing statistics from the Ministry of Food and Agriculture (MOFA). These studies urged such policies as irrigation and food storage system to enhance agricultural productivity, making food available for household consumption.

Similarly, using sampled data from Sekyere-Afram Plains District of Ghana, Aidoo, Mensah and Tuffour (2013) assessed the determinants of food security to include household size, farm size, off-farm income, credit access; factors that Abafita and Kim (2014); Kahsay and Mulugeta (2014) confirmed in their study whiles analysing the determinants of household food security in rural Ethiopia. Thus, larger households size contributes to household food insecurity compared to smaller household sizes and hence these studies advocated for intervention to address family size. These studies concluded that household

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receiving having access to credit invest these resources into agricultural activity; which increase food quantity available for household consumption. Annim and Frempong (2018) findings favoured the directional impact of credit on household food security using three rounds (4, 5 and 6) of the Ghana Living Standard Survey.

Hinging on the determinants across all four pillars of food security, Ngema, Sibanda and Musemwa (2018) using HDDS and Household Food Consumption Score (HFCS) tool confirmed the findings in their study in Maphumulo Local Municipality, South Africa and further argued the significance of education, employment, access to irrigation facility and asset ownership in household food security as Aidoo *et al.* (2013) indicated. The study confirmed the findings of Bruening, Argo, Payne-Sturges and Laska (2017) which revealed that a low level of education underwrites to food insecurity status. Thus, education enables household heads to make well-informed decisions on food production and dietary diversification for a healthy life (Generoso, 2015; Regmi & Paudel, 2016; Bruening *et al.*, 2017). Likewise, Birkenmaier, Huang and Kim (2016) stated that being unemployed accounts for household food insecurity. They argued that employment has a positive effect on food security by accruing adequate income which enhances household food consumption whiles analysing food insecurity and financial access in recession periods.

Adding on, Agidew and Singh (2018) noted that male-headed households on average are more food secure than female-headed households while analysing the factors of food insecurity among farm households in South Wollo Zone of Ethiopia. Likewise, he noted that people in rural areas have

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higher food insecurity status in developing countries compared to urbanites; which confirmed the study of Smith, Kassa and Winters (2017). With the effect of marital status on food security status, Chege, Ndungu and Gitonga (2016); Ebadi *et al.* (2018) discovered that households with married heads are more food secure compared to non-married heads. These studies revealed that married head have more income than those who are not married based on joint resource which reduces their odds of being food insecure Nevertheless, Sekhampu (2017) results contradict this finding and argued that marital status reduces the chances of being food secure and that married couples had an additional person to feed, thus increasing resource burden of household. The argument on the age of household head is mixed. Whereas Babatunde, Omotesho and Sholotan (2007); Kuwornu, Demi, and Ditchfield (2013) assert that younger household heads are relatively strong to produce more food and engage in more productive activities, Arene and Anyaeji, (2010); disclosed a positive correlation between age and food security in Nsukka Metropolis, Nigeria, where older household heads were more food secure than the younger household heads. The argument stems from the fact that matured household head has better access to capital than the younger head. Likewise, older household heads are assuming to have high experience in their related occupations; which turns to improve their returns and in the long-run their food security status.

In discussing determinants of household food security, evidence reveals migration to be one key factor, although its direction is not clearly stated in the literature. Reviewing the linkage between migration, agricultural, food security and rural development; Crush revealed that food security shocks motivate people to remit using a survey of 11 African countries. He further argued that

migrant knowing the food security status of their homes transfers resources back home which is crucial for household food security. Instinctively, Litchfield and Waddington (2003) employed OLS regressions using data from two waves of the Ghana Living Standards Survey (GLSS) to study the effect of migrants' transfers on household consumption expenditure, poverty status, and primary school attendance in Ghana. The study discovered a significant positive effect of migrant transfers on household consumption. Tsegai (2005), using data from the Volta Basin of Ghana, confirmed Litchfield and Waddington (2003) findings of a positive impact of migrants transfers on consumer welfare, however, employing a more robust methodology that corrected for selectivity bias. According to Luginaah *et al.* (2009), most people in the Upper West region migrate to Southern Ghana due to the environmental condition which makes agricultural activities less lucrative. The study revealed that migrant transfer both cash and food to family back home to enhance their livelihood strategy.

Arguing alternatively to migration-food security discourse, Duda, Fasse and Grote (2018) revealed an inverse effect of migration transfer on household food security status, using rural households in the Dodoma and Morogoro districts of Tanzania. Applying logistic regression and Propensity Score Matching approach, they noted that migration deteriorates food security status of migrant households in terms of availability, access, and stability. The study further argued on the basis of the loss in labour input, which lowers agricultural productivity that cannot be compensated with remittances from migrants. The outcome from these findings pose inconclusive direction for policy analysis and hence require strategies to consolidate outcomes stanching from optional methodologies and data in order to engender veracity of results.

Addressing food insecurity across the globe, it is prudent to note the role of cash transfers in achieving food security. Social transfers have increasingly become a crucial component of food security by improving increased spending on food and augmented food consumption among the poorest households in sub-Saharan Africa (UNICEF, 2017). Precisely, the UNICEF transfer project (2017) revealed that these transfers affect household food security. Burchi, Scarlato and d'Agostino (2016) provided a systematic overview of how cash transfers impact food security using data from selected Sub-Saharan Africa countries. According to their findings, cash transfer reduced food insecurity in both short and medium term in all countries studied except for Ghana and Tanzania where the intervention has less effect on food consumed. Further, the study revealed that CTs does not necessarily improve nutritional status, a crucial dimension of food security, and hence advocated food transfer to promote food supplement. Burchi *et al.,* (2016) further evaluated variations in the prevalence of under-nourishment indicators between 1990s and 2000s for Ethiopia, Kenya, Malawi and Rwanda. The results suggested that CTs have effect on access to food and significantly reduced food insecurity, thus reducing the peril for becoming persistently hungry, although differences in magnitude exist across countries studied.

Exemplifying the effect of cash transfer on food security, it is worth mentioning the use of these transfers and the transmission on food security status. It is evident from the UNICEF transfer project (2017) that a large share of the cash received is spent on daily consumptions with less of it directed at investment activities regardless of conditionality of transfer. Buller, Hidrobo, Peterman and Heise (2016) posited an interesting finding with the usage of cash

transfer. Using a mixed methods analysis combined with secondary study from a randomisation process, they revealed that transfers meant for food consumption have helped improve food security among marginalised household and likewise reduced violence women in northern Ecuador. Also, Ahmed (2013), noted that social safety net transfer works best for the poor household in Bangladesh; where most of these poor households use the resource they receive for daily purchases for consumption purposes.

Drawing from the determinants of food security, transfer of resources from one person to another was found to be one key variable of influence. In line with the literature, remittances have diverse impact on income, human and social capital among recipients (Crush, 2013; Adam, 2011; Generoso, 2015; Babatunde *et al.*, 2007; Duval &Wolff, 2013). On the effect of remittance, Abadi *et al.* (2018) employed a sample of 301 farm households from the Tigray Regional State of Ethiopia to study the impact of remittances on food security. The result of average treatment effect (ATT) showed that households who receive remittance have expressively lower CSI, rCSI and HFIAS; thus have lower experience of inadequate quantity of food intake on average as relative to households without remittance.

Ebadi, Ahmadi, Sirkeci and Melgar- Quiñonez (2018) confirmed the findings of Abadi *et al.*, (2018) by exploring the association between food security and receiving remittances through the use of the FIES in Global South. Using data from the 2017 Gallup World Poll (GWP), Ebadi *et al.* (2018) found a significant relationship between remittance and food security, however, as to whether the association hold for the individual countries, one cannot clinch since the study failed to consider country-specific effect. The metric of food security

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employed by Ebadi *et al.* is illuminating, as it gives substantial intuition into food security with the use of FIES, however, the purpose with the assignment of FIES was geared towards cross country comparisons with no focus for detailed households' outcomes within various countries.

Remittances, as part of the coping tactics in improving food insecurity, functions through diverse medium for its impact to be distinguished. Reviewing the state of knowledge about the use of remittances and how it relates to food security, Duval and Wolff (2013) revealed that remittance influence stable incomes for families and affiliates in Kosovo using quantile regression. He explained that this income enhances household consumption by almost 28 percent, and this affect household food security. With evidence for Southern Africa, Crush (2013) confirmed that rural household does not invest remittances in agriculture but in daily consumption. Generoso (2015) confirmed this finding by employing partial proportional odds multinomial logit in the case of the Sudanian zone of Mali. However, it appears the estimates from these studies may suffer from potential bias, given that the study failed to account for self-selection of households into the migrant remittance. Specifically, Adams Jr and Cuecuecha (2010) controlling for selection and endogeneity revealed that remittance-receiving households on the average increase their consumption expenditure by 8.5 percent compared to non-remittance receivers.

With a search for a wider outlook on the effect of remittance, Mabrouk and Mekni (2018) notably confirmed a significant positive effect of remittance on the access, stability and utilisation dimensions. Analysing remittances and food Security in some Selected African countries, they postulated that remittance supplement food security across the various dimension and thus

lower the incidence of harsh coping strategies. This corroborates the finding of Adams Jr and Cuecuecha (2010) which concluded that remittance boosts people to consume more macronutrients in Guatemala. Nevertheless, Babatunde and Martinetti (2011) applying a 2SLS, IV-Probit, Poisson and OLS concluded that the impact of remittance on food security is short-lived and does not accord everlasting livelihood strategy in Nigeria and further contended that the money received is not spent on quality foods. Using data from the Upper West Region of Ghana and employing multivariate ordered logistic regression, Atouye *et al.* (2017) findings demonstrated that remittances on their own are not enough to improve household food insecurity. Likewise, Ahmed (2013); Rao and Hassan (2012) supported this stance and argued that remittance rarely contributes to nothing including food security but rather increase dependency. This brings to font an inconclusive stand regarding the position of remittance in affecting household food security.

Arguably, variation in the directional effect could be attributed to country variation, nevertheless, disparities hold for the effect of remittance even within similar spatial settings. Once again, dynamics other than spatial and country settings, such as measures of food security could also account for such variations. The pertinent question to ask oneself here is how food security status was measured across the various studies. Did the above studies employ the same measure of food security? The obvious answer is No. Food security has been measured differently across studies. Whereas Abafita and Kim (2014) employed self-reported measures and multidimensional index based on Principal component analysis, Ebadi *et al.* (2018) used FIES. What entails in each measure differs and hence one would expect diversities when the various

measures employed. Regardless of the variation across these studies on the determinants of food security particularly the remittance variable, a point worth noting is that these studies focused on cash remittance and thus disregarded other forms of remittance whiles analysing the effect of remittance on food security.

With the availability of empirical studies broadening, Adam Jr (2011) defined remittance to include both cash and in-kind transfers. The aforementioned evidence provided valid information pertaining to the impact of remittance on food security, however, most of these focused on cash remittance disregarding in kind remittance and its impacts on food security. Evidence, however, suggests that cash is not the only means by which people contribute to household security given that people also send food (Crush & Caesar, 2017). Responsive to the significance of food remittances for food security, with the African Food Security Urban Network (AFSUN) survey of 6000 poor urban households in 11 Southern African cities in 2008-2009, Crush, (2016) revealed that on the average one out of three of the surveyed population received food remittances from relatives or friends outside their home. Of the 1,809 households receiving food transfers, almost 78 percent of recipient households said that food received was important to the household, while 9 percent said they were critical for household survival. Also, Pendleton, Crush, and Nickanor (2014) disclosed from the survey that food transfers were predominantly essential for food-insecure urban households in Windhoek. These studies centred on the effect of transfers on urban households.

Alternatively, Djurfeldt (2015) with researchers from Sweden's Lund University in 2008 interviewed 3,388 rural farm households in nine African

countries to ascertain food transfer among household in surveyed areas. The study realised that remitting food differs with households' income, proximity and destination and argued food remittance is key across the African region. The survey revealed that the most frequent type of remitting is the rural-rural mode of transfer. It is worth mentioning that these studies employed only descriptive statistics in analysing the effect of food remittance and that with the absence of quantitative analysis; the magnitude of the effect of food remittance is overlooked imposing a limitation on these studies.

Crush and Caesar (2017) appraised why food remittance matters in linking rural and urban households and food security by reviewing food transfers in some selected Southern Africa countries. The review revealed that food remittances reduce food insecurity levels among urban households and likewise strengthen social network. Frayne *et al.* (2010); Campbell (2010); Tawodzera (2012) fortified the social relations where remittance is seen to foster and maintain the survival of socio-cultural interactions among household's members. Djurfeldt (2015) harnessed food remittance and food security and noted that food transfer connotes an instrument for offsetting food shortages and maintaining food security. It is worth mentioning that analytic and econometric studies that relate to food remittance and food security are missed in these studies. The aforementioned studies considered the descriptive background of food transfers without aligning the impact of transfers to the magnitude of effect relating to food security indicators. Hence, it is expedient to note at this point that a useful econometric model would be necessary to resolve this shortcoming.

Examining the importance of food remittances in the perspective of household food security in the Upper West Region (UWR) of Ghana, Kuuire *et*

al. (2013) employed in-depth interviews to display the tendency of reliance on food remittance as a coping strategy among households. Food remittance according to the study is critical for household survival in the UWR, typically in the lean production period. Kuuire *et al.* (2013) confirmed the findings of social linkages relating food remittance which symbolise the steadiness of kin relationships among relatives in the Upper West region of Ghana. According to Gentilini (2016), both cash and food transfers strengthened food security, hence these forms remittance should be aligned with food security. With his global analysis review on cash versus food debate, Gentilini (2016) posited both cash and food transfers should be encouraged. This conclusion is noteworthy given that both cash and food remittance institute an imperative path for evading household food insecurity. Therefore, the current study would incorporate both cash and food transfer to assess their effect on food security.

Gap in existing Literature

Against the backdrop of the literature reviews in the domains of the theoretical and the empirical literature review, the following gaps are evident in the food security assessment in Ghana.

With regards to the measure of food security, most studies resorted to the use of dietary diversity which does not account for cross-culturally variation. With the study of Ebadi *et al.* (2018) which applied a psych-physio experience measure, the study looked at how remittance affects the FIES of global south countries but not household food security status. In the specific case of Ghana, available evidence of food remittance is mostly region specific, hence, the current study tends to consider the effect of food remittance on household food security by employing nationally representative data.

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Likewise, existing empirical works on remittance on household food security analyses have largely concentrated on cash-based transfer to food security analysis. Reviewing studies that address food remittance, reasonable evidence exists on the effect of food remittance on urban food security with pintsize evidence for rural food security. Notably, most studies on food remittance employed descriptive in analysing food remittance and food security, which does not give room to estimate the magnitude of the effect. In view of this, the study would concurrently examine the effect of cash and food remittances on food security across residence by using econometric techniques to offer the opportunity for balancing policies with the remittance theme.

Conclusion

The Chapter reviewed the theoretical and empirical threads of literature that are related to the study. The theoretical literature centred on the following themes; theories that underlie the conceptualisation and the measurement of food security; the entitlement theory; theories in the conceptualisation of remittance. The empirical literature reviewed focused on factors that affect food security outcomes. The chapter finally critiqued reviewed studies to appreciate the existing gaps in the literature.

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CHAPTER THREE

RESEARCH METHODS

Introduction

The study examined food remittance and food security in Ghana. This chapter presents the research methods that were employed to test the various hypotheses of the study. The chapter presents the research design, the data source and nature, the empirical model and the estimation techniques. The chapter also accounts for description, justification and measurement of variables used for the study and a brief description of regression diagnostics.

Research Design

Research design mirrors the entire research process, from conceptualising problem through to the conclusions of the study, whereas in other studies it reflects merely the methodology of a study (Almalki, 2016). It can be qualitative, quantitative or a mix of both qualitative and quantitative methods. This study is quantitative in nature given its outlined objectives and employs cross-sectional secondary data based on the positivist philosophy. Positivists rely on validity, reliability, neutrality, accuracy and generalisability to judge the accuracy of quantifiable analysis by describing, forecasting and authenticating empirical relationships in somewhat organised settings. This presupposes that findings obtained from the study are based on scientific analysis and not of value judgment. The study is, therefore, objective and without manipulations.

Data Source and Description

The study employed quantitative design which allows for the use of a nationally representative survey to engender realisation of the objectives of the study. The study used secondary data from the seventh round of the Ghana Living Standards Survey (GLSS 7); a nationwide survey conducted by the Ghana Statistical Service (GSS) that gives information on living conditions of Ghanaians using a stratified probability sampling technique based on the 2000 Population and Housing Census. The survey includes household socio-demographic variables as well as sections on food security indicators and remittance. Such variables as age and sex of the household head, household size, location, educational level, marital status, employment status, religion and ethnicity were obtained from the household demographic and economic indicators sections of the GLSS 7.

Theoretical Model Specification

The study modelled food security by invoking the theoretical definition of household food insecurity by FAO. The study explored various functional specifications to construct the theoretical model. The study modified concepts used by Philips and Taylor, (1990) and mathematically expressed food security as follows;

$$FS = Ps + f(V, Sa, Hx,) \qquad (1)$$

Where

$$Ps = f(Af, Y, Fp) \qquad (2)$$

From equation (1), FS is the household's future state of being food insecure. Future food insecurity status considers the assessment of the present

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food security state (Ps). And the probability of deviation from this state is expressed as a function of food insecurity Vulnerability(V), socio-economic assistance (Sa), household characteristics (Hx). From equation (2), Present Status is also a function of available food (Af), income(Y) and food prices (Fp) which refers to the household's current food consumption adequacy. Vulnerability considers events that affect food insecurity; measured by events that are exploited by threats emanating from natural or manmade sources that may affect the whole population or be limited to some households. Examples of such threats include food scarcities before harvest, transitory marketing problems, and increases in prices, among others. Socio-economic assistance (Sa) considers such factors that enhance households ability to access food. Examples of social assistance include employment opportunities, use of better agricultural production techniques and other altruistic support, such as supplementary feeding programs, remittance among others. Household characteristics refer to a taxonomy of household features which replicate the size and structure of the household and the means by which households get food for consumption purposes.

The study considered the optimal control problem which consists of time f(t). We specify the initial time f(t_0) which correspond to the household present state of food insecurity and, the terminal time f(t_1) which comprises time when future insecurity state mounts.

Assuming the state of food insecurity ranges from 0 to 1 with 0 being extreme food insecurity and 1, food security

$$0 \leq x(t) \leq 1 \qquad\qquad (3)$$

where x(t) is household food insecurity status at the time, t.

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Equation (3) is the equation of motion which describes the rate of time in a state of food insecurity and how households can ensure future consumption amidst shocks, socio-economic factors, household characteristics, given their present consumption status.

Measurement of Food Security

Food security was measured using the Food Insecurity Experience Scale (FIES) developed by Food and Agriculture Organisation-Voice of the Hungry (FAO-VoH) in 2014. The FIES is an experience-based food insecurity scale comprised eight questions on households' experience and behaviour related to food access over a 12-month recall period. Section with these questions was provided in The GLSS 7 and these questions are also presented in Appendix A. Food Consumption Score (FCS), which assigns nutritional weights to food items was also employed as an additional food security measure for robustness check for the estimates. The study generated food groups from food items and assigned weights to these food groups in accordance with the World Food Program (WFP) measurement. The specific food scores were summed within each household to get the final FCS. Food groups and their respective food items are presented in Appendix A.

Principal Component Analysis

Based on the sum of confirmatory responses from eight questions, a continuous score was generated using the Principal Components Analysis (PCA) to capture the FIES. PCA converts a set of correlated variables into linear combinations of usual pair-wise uncorrelated variables called principal components (Caliendo & Kopeinig, 2008). PCA is mostly used to generate

weights for the variables. Application of PCA on the FIES indicators yields a series of components of which the first component explains the largest variance in the data and successive components clarifying the additional but minor proportion of the variance in the variables. Weights from the factor scores in the first principal component are used to construct the household food insecurity index, which has a zero mean and variance equal to one. Accordingly, the PCA- is expressed as:

$$Y_j = \sum \frac{Wi\,(Zji - Zi)}{Si} \qquad (4)$$

where Y_j is the value of the jth household's food security index, Wi is the weight for the ith variable in the model, Zji is the jth household's value for the ith variable, Zi and Si are the mean and standard deviations of the ith variable for the sample. The generated food security score is used as a dependent variable for the analysis. As robustness checks, PCA requires that the index generated from first components has Eigenvalue more than one (Bro & Smilde, 2014) and the "rule of thumb" of the retentive components that capture variations should have a collective percentage above 60 (Rea & Rea, 2016). Also, the Kaiser-Meyer-Olkin (KMO), a post diagnostics test which specifies sample adequacy is predicted to have a coefficient greater than 50 percent (Kaiser, 1974).

Empirical Model Specification and Estimation Techniques

In order for the study to explore spatial variability of food security outcomes across districts, the study employs both FIES and FCS to clearly picture the spatial distribution of food security outcomes across districts in Ghana. While food security literature tends to emphasise individual-household-level variations, food security outcomes are largely entrenched in the telluric

features (Barrett, 2002). Subsequently, the study used spatial correlation directories to explore the extent to which food (in)secure households are clustered in the various districts in Ghana. The study further seeks to examine the impact of food remittance on household food security as one of its objectives. Examining the impact of food remittance on household food security based on non-experimental observation is inconsequential due to effective counterfactuals. Given that food, remittance is not randomly assigned, analysing its causal effect on household food security outcomes poses a challenge. In view of this, the study employed Propensity score matching, which compares food security outcomes for households with and without food remittance. However, due to inconsistency resulting in the use of PSM amidst unobserved factors, the study employed the Endogenous Switching Regression (ESR) technique to address the unobserved heterogeneity. In order to analyse the effect of the amount of food received on food security, the study used the Ordinarily Least Square (OLS), given the continuous outcome variable. However, due to potential endogeneity, the use of OLS is rendered biased and inconsistent; consequently, the study employed the instrumental variable approach.

Spatial Analysis

The spatial distribution of profitable activities has significant implications on the welfare outcome of households. Evidence suggests that spatial distribution in socio-economic outcomes and environmental features affect food security outcomes (Barret, 2010). The study examined the spatial distribution of food security across 216 districts in Ghana. To explore spatial variability in food security outcome, the study provides geographical intensity, district-wise mapping of Ghana. The food security outcomes are used for spatial

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analysis to explore the relationship and significance of food security patterns among districts in Ghana. With reference to Tobler's first law of geography which discovered that everything is connected to everything else, the study shoulders the fact that near things are more related than distant things. Following this law, the study anticipates that spatial factors augment the empirical understanding of food security outcomes (FIES and FCS). Hence, the study verified spatial autocorrelation for global and local analysis using ArcGIS 10.2. The Moran's I test examines spatial based relationship rather than a linear structural relationship, that allows us to test whether or not districts with high or low levels of food security outcomes are clustered spatially.

The global Moran's I, a spatial autocorrelation measure, tests whether features are clustered or dispersed. The test informs us whether or not overall spatial dependency exists among districts in Ghana (Li, Calder & Cressie, 2007)

 Specifically, the global Moran's I is given as;

$$I = \frac{N}{\sum_i^N \sum_j^N w_{i,j}} \frac{\sum_i^N \sum_j^N w_{i,j}\,(x_i - \bar{X})\big(x_j - \bar{X}\big)}{\sum_i^N (x_i - \bar{X})^2} \qquad (5)$$

where x_i is the attribute for the district I, $x_{j;}$ attribute for district j. $\bar{X}$ is the mean of the compatible features, n is the number of features and $w_{i,j}$ is the spatial weight between district i and j. The study conducts a Z-test which test the null hypothesis of spatial randomness. The underlying assumption here is that the data are stationary, implying that the distribution of food security is independent of location and can be interpreted in the same way across districts.

A point worth noting is that the global Moran's I do not tell us whether there are heterogeneities among the districts. If the global Moran's I statistic is

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significant for spatial clustering, a hotspot statistic is used to isolate the specific clustering of positive and negative autocorrelation (Manepalli, Bham & Kandada, 2011). For this reason, the study employs the Getis-Ord Gi* analysis, which allows for ascertaining high and low clustered values spatially (Jacquez, 2008) The hotspot analysis includes within district features in local mean analysis aside neighbouring districts features. Concurrently, the study specifies the Getis-Ord local statistics as;

$$G_i^* = \frac{\sum_{j=1}^{N} w_{i,j} \, x_j - \bar{X} \sum_{j}^{N} w_{i,j}}{s \sqrt{\dfrac{n \sum_{j=1}^{N} w_i^2 - \left(\sum_{j=1}^{n} w_{i,j}\right)}{n-1}}} \qquad (6)$$

With i x_j j $\bar{X}$ and $w_{i,j}$ already defined from equation (6). The Z-score of the index and p-value are used to test whether the clustering of features is statistically significant. A high z-score and a low p-value depict a significant hot spot whereas a low z-score and a small p-value specifies a significant cold spot. A z-score near 0 means no spatial clustering.

Spatial autocorrelation was set to aggregate features within a specified distance across districts and the hotspot analysis based was based on case count and does not account for prevalence statistics. The study further looks at the spatial distribution of food security outcomes across the 216 districts in Ghana. Noticeably, the GLSS 7 had information on 214 out of 216. Information on the other two districts; Mpohor and Kumawu were obtained using information from the old districts they were created from. Analysis of this study is restricted to local and global analysis and spatial distribution of food security outcomes without spatially estimating factors that affect food security status.

Propensity Score Matching

For one to empirically appraise the impact of remittance on food security, econometric challenges must be considered since remittance is not randomly assigned in the course of households sampling. In order to examine the relationship between the remittance receipt and food security indicator, the study relied on matching procedures. The matching technique allows the use of cross-sectional data to develop the counterfactual by matching treatment and control units in the absence of experimental design. The notion of the PSM is to match recipients and non-recipients according to the predicted propensity of receiving remittances (Rosenbaum & Rubin, 1984; Heckman, Ichimura & Todd, 1998; Wooldridge, 2015) and to create settings of a randomised trial to help assess the causative effect as in a controlled experiment.

The study employed a two-step PSM procedure which allows for a decrease in the dimensionality by matching households with the same probability of receiving food transfers, instead of controlling for each one of the covariates (Mendola, 2007). In the first step, a predicted model calculate each household's probability to receive remittance (propensity score).

Let R_i denote dummy such that $R_i = 1$ if households receive food remittance and $R_i = 0$ otherwise. Given the potential observed food security status; $Y(1)$ and $Y(0)$ for receivers and non-receiver, the study specifies the treatment effect on the impact of food remittance on household food security as:

$$\partial = Y(1) - Y(0) \qquad\qquad (7)$$

$$Y(1) = R_i Y(1) + (1 - R_i)Y(0) \qquad\qquad (8)$$

Following the Rosenbaum and Rubin (1984), the propensity

score is given as;

$$E\{Y(0)|R_i = 1, P(X)\} = E\{Y(0)|R = 0, P(X)\} \qquad (9)$$

$$0 < P(X) < 1 \qquad \forall \, X > 1$$

From (8), treatment for every household cannot be computed, hence, the average treatment effect on the treated (ATT) is estimated.

The ATT is expressed as:

$$\theta_{ATT} = E(Y(1) - Y(0)|R_i = 1) \qquad (10a)$$

$$= E[E(Y(1) - Y(0)|R_i = 1, P(X))] \qquad (10b)$$

$$= \; E[E\{Y(1)|R_i = 1, P(X)\} - E\{Y(0)|R_i = 1, P(X)\}] \qquad (10c)$$

The outcome of recipients is expressed as $E\{Y(1)|R = 1\}$ and that of those who had not to receive, $E\{Y(0)|R = 1\}$. Equation (10c) is the difference between the expected household food security outcome with or without food transfers, for those who actually received remittance.

Considering that fact that the study used a nationally representative sample, there was the need to control for the geographical localisation of households to avoid comparison bias between residential heterogeneity. Following the assumptions specified by Becker and Ichino (2002), the study controlled for a vector of observable variables to satisfy the conditional independence assumption (CIA). In order to ensure the CIA, the study tested the balancing property in line with the standardised bias approach recommended by Rubin (2001). For sensitivity analysis, the study estimated the ATT using the Common estimator, Kernel estimator and the Neighbour matching method. The study used the nearest-neighbour matching to compare groups by using single nearest-neighbour or multiple nearest-neighbours with the closest propensity

score to the corresponding receiver component. Likewise, the study checked for consistency with estimates from Kernel matching method, which compute the average propensity score from a neighbourhood of non-remittance households and match them to the propensity score of remittance households.

Notably, PSM does not control for unobservable drivers (Chen, 2008) which may influence both food remittance and food security outcomes. Therefore, the study addressed this issue of unobserved heterogeneity by providing an additional robust estimation; Endogenous Switching Regression model (ESR) (Maddala, 1986).

Endogenous Switching Regression

Endogenous Switching Regression (ESR) is mostly applied to supplement matching techniques because of its ability to control for the presence of unobserved heterogeneity and also used to assess the consistency of results to different assumptions (Kim, Nayga Jr & Capps Jr, 2000). The model is a two step-procedure where food remittance is computed using a probit model in the first stage and the second stage estimates the impact of food remittance on food security outcomes by ordinary least squares with selectivity correction power.

The selection equation for receiving remittance is specified as;

$$R^* = \delta X_I + \varepsilon_i \quad where \ R_i = \begin{cases} 1 \ if \ R^* > 1 \\ 0 \ \ otherwise \end{cases} \qquad (11)$$

Where R^* is the latent variable for remittance and R_i is its observable counterpart if households receive remittance or not. X_I is a vector of household characteristics and ε_i is the random disturbance.

$$\Pr(R_i{}^* = 1|X_I) = \Phi(\delta X_I) \qquad (12a)$$

$$\Pr(R_i{}^* = 0 | X_I) = 1 - \Phi(\delta X_I) \qquad (12b)$$

The ATT is computed by comparing the expected values of the outcomes of recipient and non-recipient in observed and counterfactual scenarios.

Following Lokshin and Sajaia (2004), the imposed exclusion restriction to account for unobserved factors. Food remittance was instrumented with the location of the sender which does not have a direct effect with food security status although it hypothetically affects the probability to receive food transfers. Also, the study considered a series of simple falsification tests to check if instruments are jointly significant in the estimation of the remittances, thus, validating the exclusion restrictions. With full maximum likelihood ESR with exclusion restrictions, the study specifies households facing two regimes. Regime (1); to receive, and regime (2); not to receive food. This is defined as follows:

$$\text{Regime 1: } Y_{1i} = \rho W_i + \epsilon_{1i} \text{ if } R_i = 1 \qquad (13a)$$
$$\text{Regime 1: } Y_{2i} = \rho W_i + \epsilon_{2i} \text{ if } R_i = 0 \qquad (13b)$$

Where Y_{1i} is food security status in regimes 1 and Y_{2i}, food security outcome for regime 2; W_i represents a vector of exogenous variables and ϵ_i is error terms that are normally distributed, with zero mean and non-singular covariance matrix.

$$cov(\epsilon_{1i}, \epsilon_{2i}, \varepsilon_i) = \begin{pmatrix} \sigma_{\epsilon 2}^2 & . & \sigma_{\epsilon 2\varepsilon} \\ & .\sigma_{\epsilon 1}^2 & \sigma_{\epsilon 1\varepsilon} \\ . & . & \sigma_{\varepsilon}^2 \end{pmatrix} \qquad (13)$$

Where σ_{ε}^2 is the variance of the error term in selection equation (11), $\sigma_{\epsilon 1}^2 \text{ and } \sigma_{\epsilon 2}^2$ are variances of the error term in the food security outcome function (12a) and (12b), and $\sigma_{\epsilon 1\varepsilon}$ and $\sigma_{\epsilon 2\varepsilon}$ represent the covariance of $\epsilon_{1i}, \epsilon_{2i} \text{ and } \varepsilon_i$. The covariance between $\epsilon_{1i} \text{ and } \epsilon_{2i}$ is not defined since $Y_{1i} \text{ and } Y_{2i}$ are not simultaneously observed. Since ε_i is correlated with $\epsilon_{1i} \text{ and } \epsilon_{2i}$, the expected values of $\epsilon_{1i} \text{ and } \epsilon_{2i}$ conditional on the sample selection is nonzero:

$$E[\epsilon_{1i}/R_i = 1] = \sigma_{\epsilon 1\varepsilon} \frac{\theta(\beta X_i)}{\varphi(\beta X_i)} = \sigma_{\epsilon 1\varepsilon} \lambda_{1i} \qquad (14a)$$

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$$E\left[\epsilon_{2i},/R_i = 0\right] = -\sigma_{\epsilon 2\varepsilon}\frac{\theta(\beta X_i)}{1-\varphi(\beta X_i)} = \sigma_{\epsilon 2\varepsilon}\lambda_{2i} \qquad (14b)$$

Where $\theta(.)$ is the standard normal probability density function, $\varphi(.)$ the standard normal cumulative density function, and $\lambda_{1i} = \frac{\theta(\beta X_i)}{\varphi(\beta X_i)}$, and $\lambda_{2i} = -\frac{\theta(\beta X_i)}{1-\varphi(\beta X_i)}$. If the estimated covariance is statistically significant, then food security status and ability to receive remittance is correlated, and thus there is evidence of switching and one can reject the proposition of the absence of sample selectivity bias.

Following Lokshin and Sajaia (2004), the study further estimated an efficient endogenous switching model by employing the Full Information Maximum Likelihood (FIML). The FIML method concurrently assesses the probit equation and the regression equations to get consistent standard errors. With the normal distribution assumption, the likelihood function for the system of equations is given as:

$$LnW_i = \sum_{i=1}^{N} R_i = \left[ln\theta \langle\frac{\epsilon_{1i}}{\sigma_{\epsilon 1}}\rangle - ln\,\sigma_{\epsilon 1} + ln\varphi(\alpha_{1i})\right] + (1 -$$
$$R_i)\left[ln\theta \langle\frac{\epsilon_{2i}}{\sigma_{\epsilon 2}}\rangle - ln\,\sigma_{\epsilon 2} + \ln(1 - \varphi(\alpha_{2i}))\right] \qquad (15)$$

Where $\alpha_{ji} = \dfrac{\left(\beta X_i + \tau_j \epsilon_{1i}/\sigma_j\right)}{\sqrt{1-\tau_j^2}}$, $j_i = 1,2, with\ \sigma_j$ denotes the correlation coefficient between the selection equation error term and error term for the outcome equation. The FIML parameter estimates of the ESM can be computed using the movestay command in STATA (Lokshin & Sajaia, 2004). For identification purposes, the order condition presupposes that X_i comprises at least a component not in W_i.

Conditional Expectation, Treatment Effects and Heterogeneity Effects

The aforesaid ESR model is used to compare the food security status households of households that receive food transfer relative to households that did not receive transfers. This is used to examine the expected food security status in the counterfactual scenario, assuming that household that received food did not receive and non-recipient households received. The conditional expectation is defined as follows

$$E(Y_{1i}/R_i = 1) = \rho_1 W_{1i} + \sigma_{\epsilon1\varepsilon}\lambda_{1i} \qquad (16a)$$

$$E(Y_{2i}/R_i = 0) = \rho_2 W_{2i} + \sigma_{\epsilon2\varepsilon}\lambda_{2i} \qquad (16b)$$

$$E(Y_{2i}/R_i = 1) = \rho_2 W_{1i} + \sigma_{\epsilon2\varepsilon}\lambda_{1i} \qquad (16c)$$

$$E(Y_{1i}/R_i = 0) = \rho_1 W_{2i} + \sigma_{\epsilon1\varepsilon}\lambda_{2i} \qquad (16d)$$

Equation (16a) and (16b) represent the actual expectations observed in the sample, where (16a) is when receivers receive and (16b), non-receivers not receiving. Cases (16c) and (16d) represent the counterfactual expected outcomes with (16c) being the probability that receivers did not receive and (16d), non-receivers receiving food transfers.

Following Heckman (2001), the treatment effect on the treated is given as;

$$E(Y_{1i}/R_i = 1) - E(Y_{2i}/R_i = 1) = W_{1i}(\rho_1 - \rho_2) + \lambda_{1i}(\sigma_{\epsilon1\varepsilon} - \sigma_{\epsilon2\varepsilon})$$
$$= TT \qquad (17a)$$

Thus, equation (17a) shows the effect of food remittance on household food security for household who actually received food.

The effect of untreated is computed as

$$E(Y_{1i}/R_i = 0) - E(Y_{2i}/R_i = 0) = W_{2i}(\rho_1 - \rho_2) + \lambda_{2i}(\sigma_{\epsilon1\varepsilon} - \sigma_{\epsilon2\varepsilon})$$
$$= TU \qquad (17b)$$

Equation (17b) gives the expected change in the food security status of households that actually did not receive had they received.

Following Carter and Milon (2005), the study computes the effect of heterogeneity. The study computed for the effect of base heterogeneity for households that receive as;

$$E(Y_{1i}/R_i = 1) - E(Y_{2i}/R_i = 0) = \rho_1(W_{1i} - W_{2i}) + \sigma_{\epsilon 1\varepsilon}(\lambda_{1i} - \lambda_{2i})$$

$$= BH_1 \qquad (18a)$$

Likewise, the study specifies the base heterogeneity for households that did not receive as;

$$E(Y_{1i}/R_i = 1) - E(Y_{2i}/R_i = 0) = \rho_1(W_{1i} - W_{2i}) + \sigma_{\epsilon 1\varepsilon}(\lambda_{1i} - \lambda_{2i})$$

$$= BH_1 \qquad (18b)$$

The study finally estimates the transitional heterogeneity; if the effect of receiving remittance is larger or otherwise compared to households that did not receive food. The transitional heterogeneity (TH) is given as the difference between equation TT and TU.

Table 1: Treatment Effects and Heterogeneity Effects.

Sub-samples	Ability to receive		Treatment Effects
	Receivers	Non-receivers	ATT
Households that receive	$E(Y_{1i}/R_i = 1)$	$E(Y_{2i}/R_i = 1)$	TT
Households that do not receive	$E(Y_{1i}/R_i = 0)$	$E(Y_{2i}/R_i = 0)$	TU
Heterogeneity effects	BH_1	BH_1	TH

Source: Author's Construct 2019.

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Ordinary Least Square Estimation

The study specifies multiple regression models to estimate factors that affect household food security with much interest in the effect of the amount of food transfers on household food security status.

$$Y_i = \pi_0 + \pi_1 food_{remit} + \pi_2 cash_{remit} + \pi_3 hh_{age_i} + \pi_4 urban_i + \pi_5 male_i$$

$$+ \pi_6 headedu_i + \pi_7 head_{married_i} + \pi_8 empstat_i + \pi_9 hh_{size_i}$$

$$+ \pi_{10} credit_{acess} + \pi_{11} ethnic_i + \pi_{12} relig_i$$

$$+ \pi_{13} dependency_{ratio_i} \qquad + \omega_i (19)$$

From equation (19), Y_i is the food security status, *food_remit* is the amount of food in Ghana cedis received by a household, *cash_remit* is the amount of cash in Ghana cedis received by a household, $credit\_access\ is$ access to credit with 0 non-recipients and 1 for household who often receive credit, *urban=1* for urban residence *and 0 if* rural residence. *head_married* equals 1 for household heads who are married and 0 for those not and $\pi_9 hh\_size_i$is the size of the household. *Male* takes on the value 1 if is a male-headed household and *0* if otherwise. *headedu* is the education status of the head of the household and take on value of *1* if head of household has ever attended school, and *0* if not, *dependency_ratio* is dependency ratio. *Empstat* measures the employment status of household heads status with 1 being employed and 0, otherwise. *ethnic and relig* captures his/her ethnicity and religion, respectively.

Instrumental Variable Estimation

Equation (19) will yield consistent estimates if cash transfer and food transfer are exogenous to changes in food security status. However, because remittance (food and cash) can be affected by other factors, this violates the

exogeneity conditions. Thus, the remittance variable (cash and food) is hence misspecified in the food security outcome equation. Another source of endogeneity is attenuation bias that may result from inaccurate information with regards to the amount of cash and food received especially with the conversion of food received into Ghana cedis. OLS estimates are inconsistent in the face of endogeneity (Wooldridge, 2010). In view of this, the study employed a Two-Stage Least Square (TSLS) estimation which involves the use of valid instruments (IVs), that is correlated with the endogenous variable (food transfer and cash transfer) but uncorrelated with the error term to yield consistent estimates (Cameron & Trivedi, 2010). The study verified the validity of the instruments following Verbeek (2008) minimum F statistics and also run falsification tests recommended by Di Falco, Veronesi and Yesuf (2011) to ascertain whether the instruments are jointly significant or not in estimating cash and food transfer and food security outcomes.

The study estimated a first stage equation the amount of food and received as the dependent variable.

$$food\_remit = \beta_0 + \beta_1 hh_{age_i} + \beta_2 urban_i + \beta_3 male_i + \beta_4 headedu_i$$
$$+ \beta_5 head_{married_i} + \beta_6 empsecto_i + \beta_7 hh_{size_i} + \beta_8 credit\_acess$$
$$+ +\beta_9 ethnic_i + \beta_{10} relig_i + \beta_{11} dependecy\_ratio_i$$
$$+ \beta_{12} loc\_sender_i + \beta_{13} rel\_sender_i$$
$$+ \mu_i \qquad\qquad (20)$$

Where;

$$cov(food\_remit_i \ loc\_sender) \neq 0 \qquad (iii)$$

$$cov(\ loc\_sender \ \ \mu_i) = 0 \qquad (ii)$$

$$cov(food\_remit_i \ rel\_sender) \neq 0 \qquad (iii)$$

$$cov(\ rel\_sender\ \ \mu_i) = 0 \qquad\qquad (iv)$$

and

$$cash\_remit = \gamma_0 + \gamma_1 hh\_age_i + \gamma_2 urban_i + \gamma_3 male_i + \gamma_4 headedu_i$$

$$+ \gamma_5 head\_married_i + \gamma_6 empsecto_i + \gamma_7 hh\_size_i + \gamma_9 ethnic_i$$

$$+ \gamma_{10} relig_i + \gamma_{11} dependecy\_ratio_i + \gamma_{12} credit\_acess_i$$

$$+ \gamma_{12} rel\_sender + \gamma_{14} charges\_of\_transfer_i$$

$$+ \gamma_{15} transfer\_mode_i + v_i \quad (21)$$

Where;

$$cov(cash\_remit_i\ \ rel\_sender) \neq 0 \qquad (a)$$

$$cov(\ rel\_sender\ \ \ \mu_i) = 0 \qquad\qquad (b)$$

$$cov(cash\_remit_i\ \ charges_i) \neq 0 \qquad (c)$$

$$cov(\ charges_i \mu_i) = 0 \qquad\qquad (d)$$

$$cov(cash\_remit_i\ \ transfer\_mode_i) \neq 0 \quad (e)$$

$$cov(transfer\_mode_i v_i) = 0 \qquad\qquad (f)$$

Given equations (20) and (21) the second stage model is given as follows;

For the food-specific model

$$food\_security_i = \alpha_0 + \alpha_1 food_{remit} + \alpha_2 hh\_age_i + \alpha_3 urban_i + \alpha_4 male_i$$

$$+ \alpha_5 headedu_i + \alpha_6 head\_married_i + \alpha_7 empsecto_i + \alpha_8 hh\_size_i$$

$$+ \alpha_9 credit\_access_i + \alpha_{10} ethnic_i + \alpha_{11} relig_i$$

$$+ \alpha_{12} dependecy_{ratio_i}\ \ + \vartheta_i (22a)$$

Similarly, the cash specific model is given as;

$$food\_security_i = \varphi_0 + \varphi_3 cash_{remit} + \varphi_2 hh\_age_i + \varphi_3 urban_i + \varphi_4 male_i$$
$$+ \varphi_5 headedu_i + \varphi_6 head\_married_i + \varphi_7 empsecto_i$$
$$+ \varphi_8 hh\_size_i + \varphi_9 agric\_activities_i + \varphi_{10} credit\_access_i$$
$$+ \varphi_{11} ethnic_i + \varphi_{12} relig_i + \varphi_{13} dependecy\_ratio_i + \epsilon_i (22b)$$

The study further computes the overall model as;

$$food\_security_i = \delta_0 + \delta_1 food_{remit} + \delta_2 cash_{remit} + \delta_3 hh\_age_i + \delta_4 urban_i$$
$$+ \delta_5 male_i + \delta_6 headedu_i + \delta_7 head\_married_i + \delta_8 empsecto_i$$
$$+ \delta_9 hh\_size_i + \delta_{10} credit\_access_i + \delta_{11} ethnic_i + \delta_{12} relig_i$$
$$+ \delta_{13} dependecy\_ratio_i + \varepsilon_i \qquad (23c)$$

Deliberating on Crush and Frayne (2010) perspective on the rural-urban dynamics with regards to transfer received, the study modified the model for residential appraisal.

The rural model is specified as;

$$food\_security_i = \theta_0 + \theta_1 food_{remit} + \theta_2 cash_{remit} + \theta_3 hh\_age_i +$$
$$\theta_4 male_i + \theta_5 headedu_i + \theta_6 head\_married_i + \theta_7 empsecto_i + \theta_8 hh\_size_i +$$
$$\theta_9 credit\_access_i + \theta_{10} ethnic_i + \theta_{11} relig_i + \theta_{12} dependecy_{ratio_i} +$$
$$\mu_i \quad if\ residence == 0 \qquad (24a)$$

Specifically, the urban residence model is given as

$$food\_security_i = \sigma_0 + \sigma_1 food_{remit} + \sigma_2 cash_{remit} + \sigma_3 hh\_age_i +$$
$$\sigma_4 male_i + \sigma_5 headedu_i + \sigma_6 head\_married_i + \sigma_7 empsecto_i + \sigma_8 hh\_size_i +$$
$$\sigma_9 credit\_access_i + \sigma_{10} ethnic_i + \sigma_{11} relig_i + \sigma_{12} dependecy_{ratio_i} +$$
$$\tau_i \quad if\ residence == 1 \qquad (24b)$$

Justification of Instruments

The study instrumented food transfer with the location of the sender(loc_sender) and relationship to the sender(rel_sender) and for cash transfer, the study used relationship to sender, charges and means of transfer(transfer_modes) as instruments. Arguably, the location of the sender influences the possibility of him/her sending remittance to a household. Intuitively, households located closer to senders are more likely to receive food transfer compared to household who live further away from senders; considering the cost involved in transfers. Clearly, the location of sender and relationship of sender correlates with food transfer but does not correlate with food security. Presumably, the relationship matters when it comes to the amount of food a household receive. Close relatives would remit more to strengthen ties and this affects the amount of food transfer. Notably, relationship to sender also influences the amount of cash received by households. Hence, both cash and food transfer were instrumented with relationship to the sender. Available means of transfer such as Banks facilitate the sending of cash. The argument here is that when such modalities are available, households are likely to receive cash transfers. Likewise, charges for cash transfer affect the amount of cash households receives. If cash transfer requires higher/lower charges, there is the likelihood that the amount of cash households receive would be affected. Equally, available mode of transfer, amount charge for transfer and relationship to sender correlate with cash transfer but does not correlate with food security. Hence, these instruments satisfy the validity condition for instrumental variable estimation usage.

F-statistic for Joint Significance

The F-statistic for the joint significance for the model is given as:

$$F = \frac{(SSR_R - SSR_{UR})/q}{SSR_{UR}/(n-(k+1))} \tag{25}$$

Where SSR_r is the sum of the squared residuals of the restricted model and SSR_{ur} is the same for the unrestricted model, n is the number of observations, k, the number of independent variables in the unrestricted model and q, the number of restrictions.

Justification and Measurement of Variables

The choice of variables used in this study was conceptually and operationally informed by evidence from both theoretical and empirical literature. These variables used were further guided by the research objectives and supported by the availability of data. The number of predictors used for the models was also subjected to the need to produce best fit models, hence variables which backed the goodness of fit were finally used.

As a predictor, food transfer was measured as a dummy with value 1 for household who receive food and 0 for non-recipient household and again the study included the total amount of food received by households over the last one year expressed in Ghana cedis. The inclusion of food remittance is important because it enables the study to properly disentangle the effect of remittances in line with both cash and food transfers. Food remittance has been proven to improve household food security status and also reduce food insecurity experiences among vulnerable households (Crush & Caesar, 2017; Frayne *et al.*, 2010; Tawodzera, 2012). The study, therefore, hypothesised a positive effect on household food security outcomes.

Likewise, the amount of cash received by household over the last year period valued in Ghana cedis is considered. The total amount of cash transfers received by household was derived by summing transfers received by every member of households for the period of 12-months. Regmi and Paudel (2017); Crush (2013); Adam (2011); Generoso (2015) suggested that cash remittance is important to elevate the food security situation of households when cash is substantially spent on food needs. Conversely, Atuoye *et al.* (2017), Abegaz (2017) and Rao and Hassan (2012) demonstrated that cash remittances are not enough to better the food insecurity. Hence, the expected effect of cash remittances on food security is not determined.

The study considered the age of household head. The first assertion with regards to the age of household head is that younger household heads are relatively food secure (Babatunde *et al.*, 2007; Kuwornu *et al.*, 2013). Contrary, Arene and Anyaeji, (2010) disclosed a positive correlation between age; older the head, the more food secured the household. With these empirical views, the expected effect of age of household head on food security is indeterminate. From literature, the study captures sex of household head, which is dummy variable (1= male and 0=female), to account for gender differential effects on household experiences on food security. Maxwell *et al.* (2013) revealed that females are disadvantaged in terms of being destitute of socio-economic prospects, which hinder their capacity to ration resources to enhance household food security status, hence male heads are more food secure compared to female heads. Thus, gender influence household food security status (Agidew & Singh, 2018) and so, hypothesised to have a positive relationship with food security.

To control for the variations in food security status that may arise as a result of locational, a dummy variable (1=urban; 0=rural) is introduced in the model to capture the fixed effect across this residence. Abadi *et al.* (2018); FAO (2017) revealed that urban households are more food secure compared to rural household. Empirical backing is that urban households are exposed to more socio-economic opportunities which enhance their resource acquisition as well as food security status. A prior expectation of the effect of residence on food security outcomes is positive. Also, marital status was captured as a dummy, 1 for conjugal household and 0 for non-married household heads. Value 1 comprises married household head and heads living with couple whereas 0 includes all other categories other than the married component-unmarried, separate, divorced and widowed. Households with married heads are revealed to be more food secure relative to non-married heads. (Chege, Ndungu & Gitonga, 2016; Ebadi *et al.*, 2018). Nevertherless, Sekhampu (2017) results contradict this finding and argued that marital status reduced the likelihood of being food secure and that married couples had an additional person to feed, thus increasing resource burden of household. This leaves this study with unknown expectation.

The covariates included education of household heads which is coded 1 for household heads who have attended school and 0 for heads with no schooling. Drawing from empirical literature, educated household head are relatively food secure compared with household heads with no education. Bruening *et al.* (2017) argued that low level of education limits ability to pursue higher earning job opportunities, and that educated household head can explore better employment avenues to increase income (Ngema, Sibanda and

Musemwa, 2018). Hence, the study expects a positive significant effect on food security. Likewise, the effect of employment on the access pillar of food security is accommodated by incorporating the employment status of the household head. Regardless of the employment type, employment status takes on value 1 for those employed and 0 for household heads who are unemployed. Since the effect of employment on the lives of people is positive through the accruing of income (Abadi et. al., 2018; Birkenmaier, Huang & Kim, 2016), in the same light the study projects positive effect on their food security status.

Dependency ratio describes the ratio between the size of a household and the number of members actively working to provide resources for the household. Specifically, the expressed the dependency ratio as

$$Dependency\ Ratio =$$

$$\frac{Number\ of\ people\ aged\ 0\ to\ 14\ and\ those\ aged\ 65\ and\ over}{Number\ of\ people\ aged\ 15\ to\ 64} \qquad (26)$$

Where household members under the age of 15 and above the age of 64 reflect dependents and members between ages 15 and 64 are the working force. Dependency ratio is likely to sway the household food security status whereby households with a somewhat large number of dependents relatively resort to limited food available (Feleke *et al.*, 2003). The resultant effect of dependency ratio on household food security is expected to be negative. The study included household size in the model on the basis that individuals in larger households tend to exert more pressure on available food and this adversely affects their food security status compared to members in smaller households. Tsegay (2005); Aidoo et. al. (2013) argued that larger household size rather compounds burden on consumption than increase the household labour strength for

production purposes. Hence the predicted effect of household size is negative on household food security outcomes.

Access to credit describes the capacity of a household to secure credit either for the purpose of consumption or for investments. Evidence supports the fact that when households are able to obtain credit, it can serve as a tool to smoothen household income and consumption within periods of severe food shortages (Kahsay & Mulugeta, 2014; Babatunde *et al.,* 2007; Annim & Frempong, 2017). Access to credit is hypothesised to influence food security positively. Also, religion and ethnicity which represent cultural acceptability of food security among Ghanaian households were also included in the model. Religion and ethnicity represent social network (Kahsay & Mulugeta, 2014) and the magnitude of effect is expected to vary across groups.

Justification of Data

The GLSS 7 has information on household food insecurity and remittance received by households. The GLSS 7 successfully surveyed 14009 households at a 93.4 percent response rate, making the data very rich and reliable. The sample for food security index derived from the eight (8) food insecurity questions was 13,829 implying 180 missing observations. In line with the objectives of the study, the data was partitioned into two, households who receive food and cash. From the overall sample, 7668 individuals received cash remittances while 7674 individuals received food transfer. The total amount of remittance received by the household was derived by summing the value of transfer in Ghana cedi received by all individuals in the household, implying that the unit of analysis for the study is the household. Due to missing values on

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some covariates, 4671 final sample was obtained after merging the various sections of the dataset.

Regression Diagnostic and Post Estimation Tests

For the model estimates to be robust, unbiased, efficient and consistent, the data was first cleaned to deal with outliers, implausible and missing values. Likewise, diagnostics tests were also conducted. To account for heteroskedasticity, STATA by default assumes homoscedastic standard errors adjusted via heteroscedasticity-robust standard errors, to deal with the problem of heteroscedasticity. The Ramsey RESET was used to check for omission of variables from the models and the variance inflation factor (VIF) is computed to test for multicollinearity. The study further tested for model specification with the use of the link test. For the IV model, to test whether the instruments are weak, the study used the F-statistic of the first stage regression proposed by Stock and Yogo (2002). Following Cragg-Donald Wald F-statistic, the study confirmed the test for weak instruments (Kleibergen & Schaffer, 2015). For Overidentification (validity test), the study relied on Sargan tests which assume errors to be independent and identically distributed (i.i.d) (Hayashi, 2000).

Conclusion

This chapter presents research methods that were employed to test the various hypotheses of the study. Specifically, the study employed spatial analysis to analyse the distribution of food security outcomes across regions in Ghana. The study first employed the Propensity Score Matching and Endogenous Switching model to examine the impact of food remittance on food security outcomes. To compare the effect of the amount of food and cash

received, Instrumental Variable estimation was employed to account for inconsistency from the problem of endogeneity associated with the use of OLS while controlling for other variables.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter analyses and discusses the results obtained from the study. The chapter is divided into three main parts; the first covering the descriptive statistics, the second part touches on exploratory spatial analysis and lastly econometric analysis. The findings are presented in the form of tables and graphs with their respective discussions.

Food Insecurity Experience Scale (FIES)

Following the procedure described in equation (4) from the methodological section, the study employed PCA to construct FIES at the household level. The PCA result shows that the first factor explained about 65.8 percent of the total variation in the data. Thus, based on the first component, FIES was constructed. Eigenvalue greater than 1 was used as the criterion for extracting factors. Given the threshold for the inclusion of a variable as 0.5, all 8 observed variables were retained. Prior to computing FIES with PCA, the suitability of data for analysis was considered. The Kaiser-Meyer-Oklin value for sampling adequacy of 0.93, exceeding the suggested value of 0.6, justified that the food insecurity score generated from the use of PCA is applicable and that strong pattern of correlation exists among questions. Results from the PCA analysis is presented in Appendix B.

Descriptive Statistics

Table 2 shows results on the differences in mean among some key variables across residence. The FIES for households in rural areas is 0.616

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points compared to **-**0.466 points for urban households. The mean FIES for urban households implies the reduction of food insecurity compared to a higher FIES for rural households. The significance test of the difference of FIES across residence was statistically significant at one percent indicating the relevance of variation in food insecurity status among rural and urban households. Consistent with the findings of Abadi *et al.* (2018), rural households' evidence higher food insecurity levels compared to households in the urban areas. Likewise, the FCS on the average is higher for urban households with a mean score of 130.4 compared to an average score of 111.4 for rural households.

Table 2: Differences in Key variables across Residence

	Mean of Variables			
Difference				
Variable	**Rural**	**Urban**	**Rural– Urban**	**p-values**
FIES	0.616	-0.466	1.083	0.00
FCS	111.365	130.375	-19.01	0.00
Food Received	117.563	160.187	-42.624	0.00
Cash received	703.249	1566.235	-862.986	0.00
Observation	2,663	2,008		

P-values are probabilities of significance obtained from the Two-sample t test with Equal variances

Source: Author's Construct 2019.

The average amount of food received by urban dwellers is GH₵ 42.6 more than the amount rural households received over a 12-month period and is statistically significant at one percent. For receivers of cash remittance, findings

showed that urban households received a larger amount of cash on the average compared to their rural counterparts; with a difference of GH₵ 863 which households is statistically significant at one percent.

Using FIES, food insecurity status patterns differs across the 10 regions in Ghana. Comparing household food security status across regions in Ghana, Figure 1 shows that the regions in the Northern part of Ghana experience higher levels of food insecurity; 91.6 percent of households in the Upper East region are food insecure, followed by Upper West region with 88 percent and Northern region with 87.7per cent. Considering the high poverty status among households in these regions (GSS, 2017) coupled with environmental features characterised by impulsive rainfall patterns, agricultural productivity in these regions is uneven (Atuoye *et al.*, 2017), notifying such food security status.
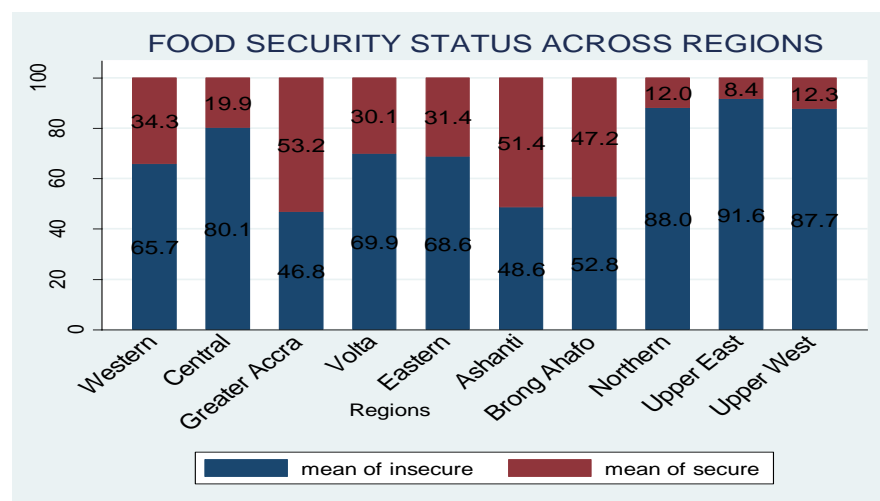
Figure 1: Food Security Status across Regions in Ghana

Source: Author's Construct 2019.

Matched with regions southern Ghana, structural meagerness in these regions according to Nkegbe, Abu and Issahaku (2017) has compounded the vulnerability of households informing insecurity status among regions in northern Ghana. Given the physical and economic constraints, the food security

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status in these regions is not surprising. With regions in the southern country, figure 1 shows that the Central region experiences higher food insecurity with 80 percentage points. Ashanti and Greater Accra region showed a lower percentage of food insecurity experience; 48.6 and 46.8 respectively. This could be attributed to the infrastructural development and socio-economic activities in these two regions.

Considering the food security status among male and female heads across residence, figure 2 shows that male-headed households in both rural and urban areas have higher food security status compared to their female counterpart. The difference in food security status among sex for urban is 7.2 percent which is higher compared to 3.6 percent difference for rural heads.
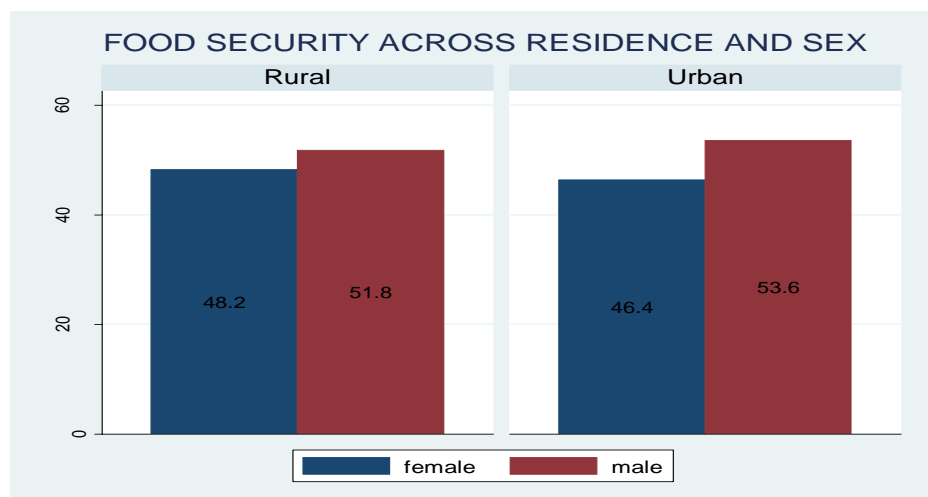
Figure 2: Food Security Status across Residence and Sex

Source: Author's Construct 2019.

From figure 2, female-headed households in rural areas have high food security score compared to urban female-headed households. Intuitively, male-headed households exhibit such food status across residence given the pattern of labour market exclusion and households role which makes most female heads

less capable of attracting the more lucrative jobs to accrue adequate resources to enhance consumption pattern.

Figure 3 considers the food security status across the frequency of transfer and residence. From figure 3 below, frequency of transfer is sequential for food security status among rural households where a higher percentage value of food security status is associated with the weekly transfer and lower percentage values for annual transfer. Other commentators like Kuuire *et al.* (2013) also reported similar findings for regions in northern Ghana. The difference in percentage between weekly transfer and monthly transfer among rural household is 1.1, imparting the relevance of frequent transfer.
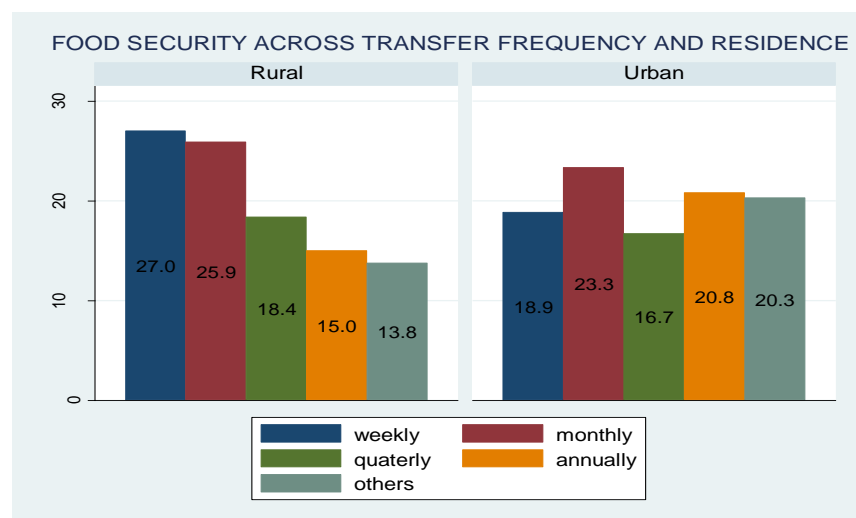
Figure 3: Food Security Status across Frequency of Transfer and Residence

Source: Author's Construct 2019.

Whereas weekly transfer shows higher food security status for rural household, monthly transfer shows higher percentage points for urban households. Again for rural households, the annual transfer is associated with 15 percent food security status compared to 20.8 percent status in urban areas. Among urban households, quarterly transfer depicted lower percentage point in food security status compared to other non-regular transfer to rural households.

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From figure 3, one can infer that transfers made on a regular basis are associated with higher food security status for rural households.

To consider the element of reciprocity among remittance, figure 4 considers the food sent and receive across residence and sex and simultaneously looks at cash received and sent across residence and sex.

Figure 4: Food versus Cash Received and Sent across Residence and Sex

Source: Author's Construct 2019.

From figure 4, besides urban male-headed households who received a greater percentage of cash, female-heads has a higher percentage in terms of both cash and food received across residence. The difference in food received among heads is 23.4 percent and 12.2 percent for rural and urban households respectively. For both cash and food sent, male-headed households sent a greater percentage compared to their female counterparts. Rural male-heads send 24.8 percent of food higher than what female heads sent compared to a difference of 7.8 percent of food sent among urban male heads. There is greater variation in the percentage of cash sent among male and female households across residence compared to variation in food sent. Generally, female-headed households are on

the receiving of both cash and food whereas male-headed households are on the giving end.

The study exemplified the amount of food received across households' relationship to senders of food remittance and residence.
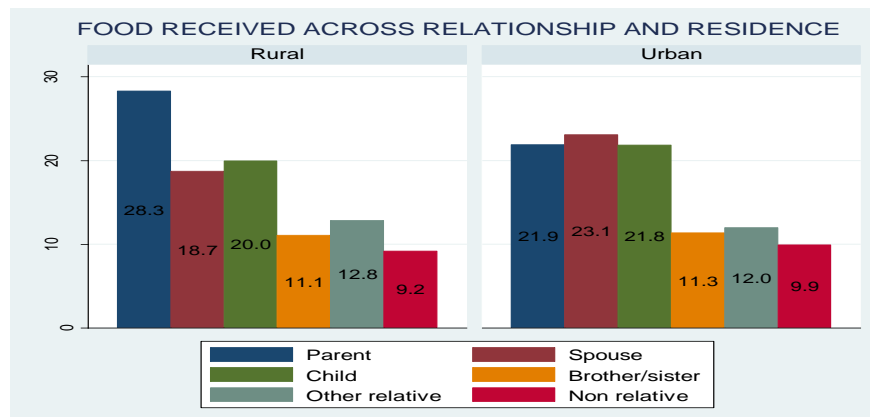
Figure 5: Food Received across Relationship and Residence

Source: Author's Construct 2019.

From figure 5, parents in rural households receive higher volumes of food transfers relative to spouse in urban areas receiving higher volumes of food transfer. Across residence, non-relative recorded the lowest percentage value of food remittances, 9.2 percent and 9.9 for rural and urban households respectively. There is no much difference among urban parent (21.9 percent) and urban child (21.8) receiving food remittance. Likewise, among urban folks, other relatives have a higher percentage value of food transfers (11.3 percent) compared to that of brother/sister. Given the lower percentage points among non-relatives across residence, one can infer that relationship is crucial to households' chances of receiving food. Demonstrating this, the closer one is to the sender, the higher the amount of food received.

Figure 6 indicates households use of cash remittances by residential welfare quintile group. Across all residence welfare status, cash received is

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mostly spent on daily consumption. With the use of cash on daily consumption, rural poor and urban rich households on the average recorded the highest percentage value, 23.7 percent each followed by the rural rich (12.9).
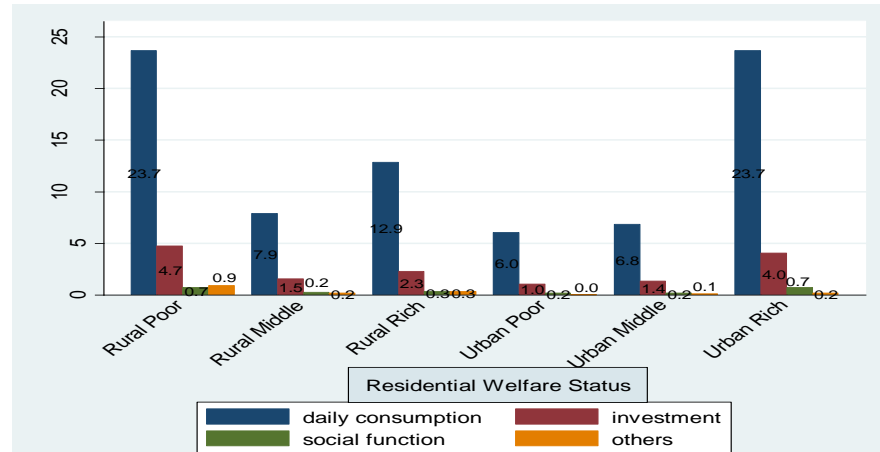
Figure 6: Use of Cash Received across Residential Welfare Status

Source: Author's Construct 2019.

From figure 6, a lower percentage of cash received is spent on social function across the residential welfare groups. Per Figure 6, it is quite amazing to see to an urban rich group having higher daily consumption with the use of cash transfer other than investment. The illustration from figure 6 gives a clear indication that households spend more of cash received on food regardless of their welfare status; thus hinges on the importance of food consumption to households' livelihood. Food as a key element in the food security discourse is emphasised with a higher percentage of cash spent on food.

Spatial Analysis

In this section, the study presents the distribution of food security levels across districts using spatial data analysis. The study presents findings on spatial autocorrelation (Global Moran's I) and Hot Spot Analysis (Getis-Ord Gi*) to

assess the level of significance of clustering of food security outcomes and equally to predict hot and cold spots across districts in Ghana.

Table 3 presents global Moran's I estimate for FIES and FCS across districts in Ghana. The coefficient estimates are all positive and statistically significant for both FCS and FIES. These results suggest that there is a significant spatial dependence in the distribution of districts food security outcomes.

Table 3: Global Moran's I

Outcome	FIES	FCS
Moran's I	0.577	0.540
Expected Index	-0.005	-0.005
Variance	0.001	0.001
Z-score	21.17	19.91
P-values	0.00	0.00

Source: Author's Construct 2019.

Given the z-score of 21.17 and 19.91 for FIES and FCS respectively, there is less than 1 percent probability that the clustered pattern among districts in Ghana could be the result of random chance. The study, therefore, rejects the null hypothesis that food security outcomes are randomly distributed across districts and thus, concludes that spatial distribution of high/low food security values is spatially clustered and that the spatial processes of the observed pattern are dependent.

Although the global Moran's I suggest significant positive spatial autocorrelation, the approach does not tell us whether district heterogeneities exist in patterns of food security outcomes. Hence, figure 7 shows us the Getis-

Ord statistics for local analysis. The hot spot analysis presents the district where cases of food (in)security is most prevalent. The left panel represents local analysis for FIES whereas the right panel represents FCS local analysis.
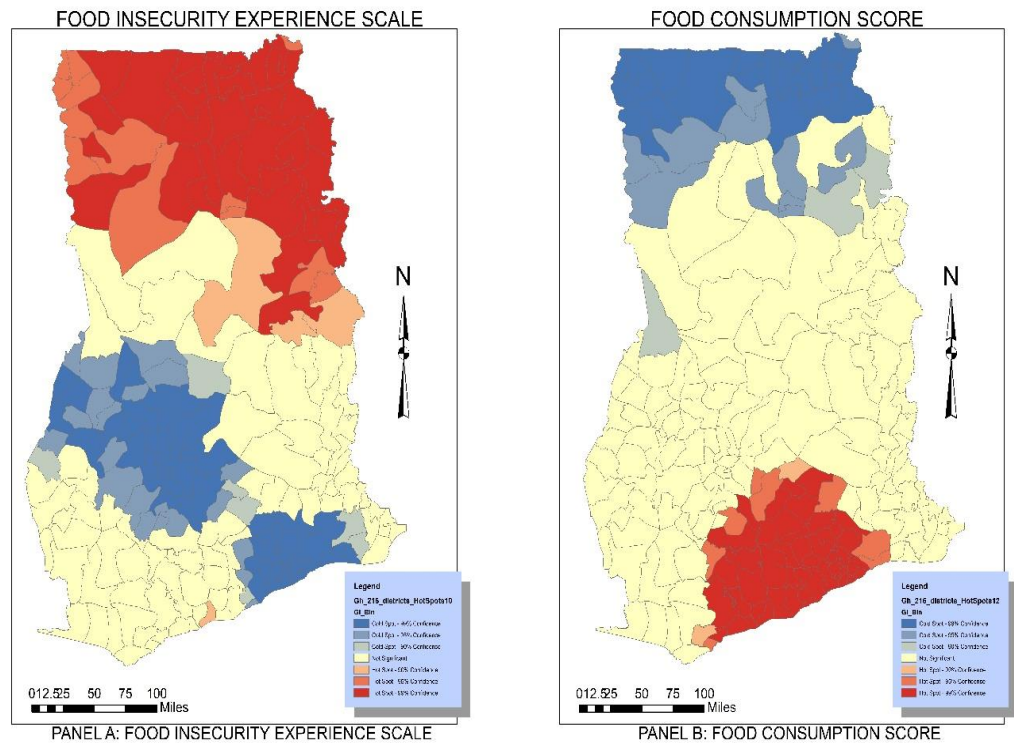
Figure 7: Getis-Ord Local analysis for Food Security Outcomes.
Source: Author's Construct 2019.

From figure 7, FIES areas with the red colour are hot spot implying higher levels of insecurity where cold spots are shown with the blue colour for low insecurity clustered districts. The red areas for FCS imply high consumption score(hotspots) and the blue are depicting otherwise. Areas shaded yellow shows random spatial processes. The prediction model illustrates the potential hot and cold spots of food security across districts in Ghana. As shown from the legend in Figure 7, there are three hot spots and cold spots cases of food security

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outcomes with 99 percent, 95 percent and 90 percent confidence interval, depicting the significance of clustering among districts.

As illustrated in figure 7, food insecurity is clustered among districts in the northern part of the country except for the Bole district and Gonja Central where clustering was insignificant, depicted by the yellow area. For the cold spot, clustering was significant among districts on the east of Awutu Senya East through to Ada East. Likewise, districts lying south of the Jaman South towards Adansi South showed significant clustering with low levels of insecurity. This implies that features within and around district collectively affect the food insecurity status of districts. Panel B shows significant clustering of high FCS mainly around districts from Sekondi Takoradi Metropolis; along the coastal zone, through to Ningo-Prampram, and further extending to some districts in the lower forest zone. The southern region of the country symbolised features of natural resource and conducive environmental factors which relatively benefit the belt with high agriculture productivity (Atouye *et al.*, 2017); showing hotspot for food consumption. Likewise, clustering is highly significant for districts in the upper north region; from Nadom through to the Bawku Municipal. The map shows about 30 out of 216 districts with blue areas; predicted to be cold spots. Noticeably, districts with relatively lower food consumption estimates are separated from districts with high estimates. The map shows that districts within the forest zone and lower Savanah are statistically not clustered in relation to food consumption.

The study infers from topographic evidence of districts in northern Ghana and further concludes that the lower food consumption score among these is as a result of their environmental make-up coupled with low economic

opportunities. Features Luginaah *et al.* (2009) noted to include long dry season and declining soil fertility characterised northern Ghana which renders farming in northern part less lucrative. Likewise, Kuuire *et al.* (2013) revealed that agricultural productivity in the region is linked with an increasing population which put pressure on arable land; hence, resulting in high food insecurity status among districts in the zone. Conspicuously, structural inadequacies exist in this part of the country relative to southern Ghana, which compounds vulnerability among households in these districts. Boxed with such environmental and socio-economic constraints, the poverty report (GSS, 2018) also reveals a high incidence of poverty among these districts. These characteristics, although not exhaustive, explain the clustering of food insecurity experience among districts in northern Ghana. The foregoing dynamics coalesced to reinforce a pattern of food security across districts in Ghana.

Figure 8 presents the spatial distribution of food security outcomes across districts in Ghana. The left panel shows FIES whereas the right panel depicts the distribution of FCS across 216 districts in Ghana. The red coloured areas for FIES have food insecurity value within 1.24 and 2.78, which implies severely insecure, with moderately insecure values lying within 0.05 and 1.25 depicted with the dark orange colour. Food secure districts are coloured blue with values within -2.59 and 1.09. The grey colour shows mildly insecure districts with values within -1.09 and 0.06.

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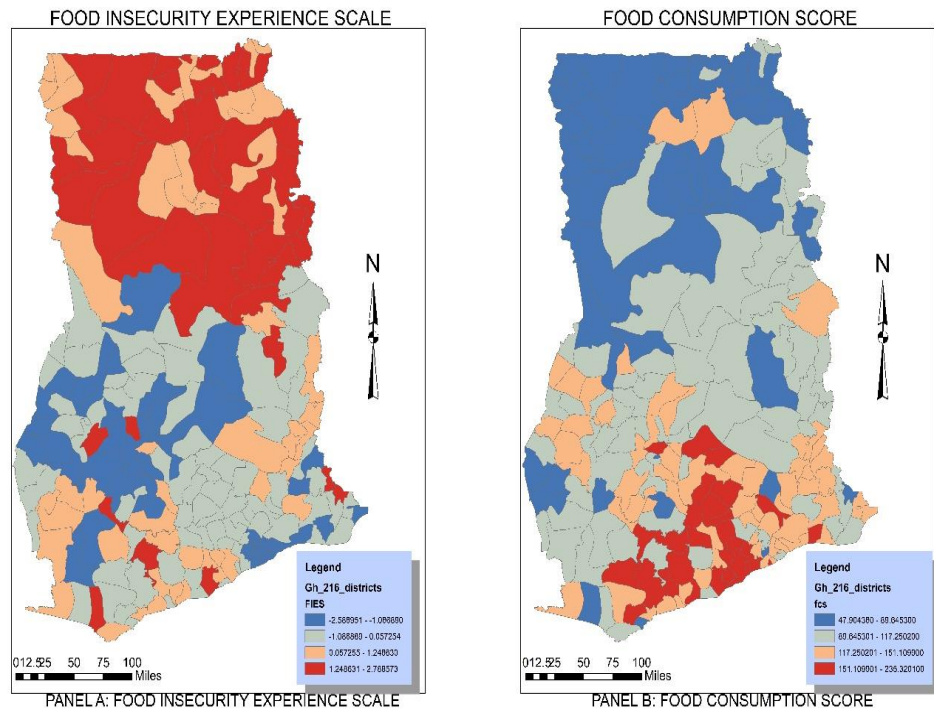
Figure 8: Food Security Outcomes across 216 Districts in Ghana

Source: Author's Construct 2019.

Figure 8 shows that districts in the Northern part of Ghana experience higher levels of food insecurity. For instance, Sissala East, Sissala West, Mamprusi West, Wa Municipal severely experience food insecurity, with such districts as Pusiga, Lawra Wa west, Tolon Temale Municipal moderately experiencing food insecurity. This is consistent with the conclusion from (Luginaah *et al.*, 2009) which highlighted a higher level of food insecurity among households in northern Ghana. Within Southern Ghana, such districts as Akatsi North, Nzema East, Twifo-Ati Morkwa, Gomoa East, Upper Denkyira likewise reported higher levels of food insecurity. Districts severely experiencing food insecurity have a larger number of its households having barely anything to eat; thus experience hunger. Illustratively, most districts in the South-western part of the country are found to be moderately food insecure.

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For such districts like Sefwi Akontombra, Aowin, Jomoro, Bodi, households are more likely to reduce quantities of food, skip meals or better still compromise on the quality and variety of food. Districts in the middle belt of Ghana showed lower levels of food insecurity. Among the food, secure districts include Amenfi Central and West, Dorma municipal, Sunyani West, Sene West, Wenchi, Ketu South. Other districts mildly suffer food insecurity and these include Shai Osudoku, Mpohor, and most districts in the Eastern region of Ghana. Households in these districts are mostly anxious or uncertain about procuring enough food.

Considering the FCS map, districts in the north-western part of the country have low food consumption score, lying within FCS values 47.9 to 80. Districts with blue colour have low diversified food consumption coupled with less nutritional intake. Zabzugu, Sene East, Bia West, Upper Manya are among such districts with less diversified food intake. These districts are undernourished in terms of the nutritional content of their food intake. The red colour depicts areas with high consumption score within 151.2 to 234.3. These districts are highly diversified in terms of the food they eat. Their food content is balanced with nutritious elements. Districts like Cape Coast with the dark orange colour have consumption score between 117.3 to 151 which implies sufficient food intake. Scores between 89 to 117 are coloured grey for discreetly diversified food consumption. Here, there is a trade-off between quality and quantity of food consumed. Nevertheless, food insecurity is higher in districts with lower consumption score especially in the northern part of the country. Among the metropolitan districts, Tamale metropolis experience a higher level of food insecurity with lower consumption score.

A point worth noting is that not experiencing food insecurity does not necessarily imply high food consumption score. Districts like Ellembelle, Ayensuano experience less food insecurity, yet their food consumption is less diversified and less frequent, portraying malnourishment. Likewise, most districts within the Bono East region experience less insecurity, however, their food consumption score is trivial. Districts within this region are noted for high food production, however, food consumption content for these districts are less nutritious. This stress on the notion that not being worried or anxious about getting enough food to eat means food is of good quality and varieties.

Econometric Results

Examining the impact of household receiving food remittance on household food security outcomes is hypothetically multifaceted. The study employed propensity score matching followed by endogenous switching regression model to address the study's hypotheses. The study first estimated the treatment effects to examine the impacts of food remittance households FIES and FCS. Due to the basic difference in the environment and household characteristics between urban and rural areas, the study derived estimates for total households and further estimate for urban areas and rural areas separately. The incentive here is to avoid questioning generalisation associated with the contrast between rural and urban analysis.

Impact of Food Remittance on Household Food Security

With the use of the PSM, the score estimates were used to balance the experimental distribution of covariates across the receivers and non-receivers (Lee, 2008), hence detail interpretation of the estimates was not given. The study

further crisscrosses the balancing procedure to test whether or not observations have the same distribution of propensity scores. Overlapping of observations in the density distribution of propensity scores for receivers and non-receivers satisfied the common support condition and provided a good basis for matching of receivers to their counterfactuals. Appendix D shows the distribution of households who receive food remittance (upper half) and those who do not receive (bottom half) by their respective propensity scores and common support area. The study further extends the finding to rural-urban variations in terms of the impact on food remitted on household food security status.

From Appendix D, the standardised bias differences between receivers and non-receivers depict that sample differences in the unmatched data considerably exceed those in the matched data and that the matching procedure creates a balance between receivers and non-receivers. The bias was significantly reduced to about 3.0 percent, 3.5 and 3.3 percent after matching for the overall, rural and urban sample respectively. The low pseudo R (0.002;0.003; 0.004 for total, rural and urban singly) and the insignificance likelihood ratio tests revealed the assumption that both groups have the same distribution in covariates after matching. This clearly confirms that the matching procedure is able to balance the characteristics of food remittance households and non-remittance households. The study evaluated the impact of food remittances among households having similar observed characteristics.

Table 4 shows the average treatment effect on the treated (ATT) of food security outcome using three matching algorithms the Common matching, Kernel method (KM) and nearest neighbourhood (NNM).

Table 4: Impact of food remittance on food security outcomes using PSM

OUTCOME/Matching	Receivers	Non-receivers	ATT	T-statistics
FIES				
Common Matching				
Total	0.036	0.257	-0.220	2.00**
Rural	0.368	0.662	-0.294	2.08**
Urban	-0.573	-0.273	-0.200	1.99**
Nearest Neighbour Matching				
Total	0.036	0.260	-0.224	2.04**
Rural	0.0367	0.664	-0.297	2.11**
Urban	-0.548	-0.255	-0.294	1.92**
Kernel Matching				
Total	0.049	0.260	-0.211	2.61***
Rural	0.444	0.664	-0.220	2.09**
Urban	-0.493	-0.257	-0.235	2.11**
FCS				
Common Matching				
Total	119.428	114.422	5.005	1.75*
Rural	114.679	108.559	6.12	1.71*
Urban	124.600	121.012	3.685	0.76
Nearest Neighbour Matching				
Total	119.425	114.269	5.156	1.70*
Rural	114.677	108.430	6.246	1.75*
Urban	124.211	120.304	3.907	0.79
Kernel Matching				
Total	119.425	114.785	4.639	2.49**
Rural	114.677	108.379	6.298	2.21***
Urban	124.67	125.011	-0.341	0.09

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Author's Construct 2019.

From table 4, the average food insecurity reducing effects as well as the food consumption increasing effect in accessing food remittance is shown with their respectively t-statistics. Across all models (overall, rural and urban), the impact of food remittance on FIES is significant whereas, for FCS, significant average food consumption increasing effects are observed for the total and rural household models. Parenthetically, the magnitude of effect across all three

matching algorithms is similar for the urban and overall FIES models. With the overall model, whereas the ATT of FIES is 0.220 and 0.224 for common and nearest neighbour respectively; statistically significant at 5 percent, the kernel matching algorithm shows an average effect of 0.211 which is statistically significant at 1 percent. The ATT for urban is 0.200 for common matching, 0.294 for nearest neighbour and 0.235 for kernel matching with 5 percent significance level for all matching algorithm. This implies that households that received food reduce food insecurity status by these magnitudes. Accordingly, the result from FIES shows that food receiving households are more sufficient in food stocks, less likely to resort to inimical coping strategy and are more psychological equipped to sustain long-term food stability. This finding corroborates the results of Crush and Caesar (2017) who observed that food remittance compensates households unfavourable coping strategies such as skipping meals. Similarly, Frayne *et al.* (2010) discovered that food remittance reduces household food insecurity experience.

Likewise, the results on the magnitude of the food insecurity reducing effects in common and nearest neighbour matching are very similar to those from kernel matching for the FIES rural household model. Ardently, the ATT for the rural model shows food insecurity reducing effect with magnitudes; 0.294, 0.297 and 0.220 for common matching, nearest neighbour and kernel matching respectively, significant at 5 percent significance level. Considering ATT results for rural and urban households separately, some interesting observations emerge. Notably, larger food insecurity reducing effect is observed for rural households who received food remittance compared to urban households. Similarly, the food insecurity reducing effect for the rural

household model is larger than the overall model. Thus, food remittance makes rural households less anxious about acquiring sufficient food and compromising the quality of food, there, reducing the frequency of their food insecurity experience. Studies from other jurisdictions that corroborate these findings are that of Crush (2013) in Southern Africa Countries and Tawedzora (2012) in Zimbabwe.

Again, rural recipients are better off in terms of food consumption, which is depicted by a higher FCS for all matching algorithm compared to the overall households. Whereas the overall average gain of receiving food remittance on household food consumption is 5.005 for common matching, 5.156 for nearest neighbour and 4.639 for kernel matching, the ATT for all three matching algorithms revolve around 6 for the FCS rural model. This shows that rural households increase their consumption patterns or adjust their food expenditures by 5.05 points for the common matching, as they receive food. Convincingly, food remittance improves the nutritional content of diets of rural receivers compared to non-receivers. Considering the FCS results, the average gain of receiving food is insignificant given the three matchings (3.865, 3.907 and -0.341) for the urban household model. Thus, the PSM results do not give solid evidence regarding the positive causality between food remitted and household FCS among urban household; perhaps due to some urban households features. Likewise, it could result from the inconsistency of PSM in the presence of unobserved bias. To check the robustness of the PSM findings, the study further estimated endogenous switching regression to control for unobserved heterogeneity.

The study included a set of explanatory variables comprising household demographic and socioeconomic factors to analyse the correlates of food security outcomes. Covariates of FIES and FCS are not discussed since it is not the prime objective of the study, however, results on the correlates are presented in Appendix E. The results from the full information maximum likelihood ESR show that the estimated correlation coefficient between the food remittance equation and the FIES is significantly different from zero for the overall and rural. The significant coefficient of correlation implies that both observed and unobserved factors influence households' ability to receive remittance and FIES and further indicates that self-selection occurred in households' ability to receive remittance. The coefficient of correlation is statistically significant for the overall model and the urban model with alternative signs; rho1 being positive and rho0, negative. The variables sigma, the square roots of the variances of the residuals of the models are statistically different from zero for all equations in the models, implying that the ability to receive food and the households' food security are correlated. Similarly, this provides support for endogenous switching and that the null hypothesis of the absence of sample selectivity bias is rejected.

Progressing further, the study presents findings on ATT and ATU, and heterogeneity effects. The predicted food security outcomes from ESM are used to examine the mean gap between receivers and non-receivers. Table 5 presents the expected food security outcomes (FIES and FCS) under actual and counterfactual conditions. From the table, values for receivers and non-receivers are explicitly shown, however, the study considers the ATT and ATU. Although

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these figures are visibly different, it is inaccurate to compare them since the two groups are inherently dissimilar.

Table 5: Results on Conditional Expectations, Treatment Effects and Heterogeneity Effects

Outcome	Ability to receive	Sub-samples		Heterogeneity effects
		Households that received	Households that did not receive	
FIES				
TOTAL	Receive	0.297	0.072	0.225
	Not receive	1.846	-1.937	3.783
Treatment Effect		-1.549	2.009	-3.558
RURAL	Receive	0.718	0.570	0.148
	Not receive	6.864	0.263	6.601
Treatment Effect		-6.146	0.307	-6.453
URBAN	Receive	-0.273	-0.564	0.291
	Not receive	0.393	-0.223	0.616
Treatment Effect		-0.666	- 0.341	-0.325
FCS				
TOTAL	Receive	118.603	124.618	-6.015
	Not receive	-18.538	-8.671	-9.867
Treatment Effect		137.141	133.289	3.852
RURAL	Receive	112.756	110.951	1.805
	Not receive	-3.886	-2.747	-1.139
Treatment Effect		116.642	113.698	2.944
URBAN	Receive	139.313	126.758	12.555

	Not receive	-14.889	-13.3582	-1.522
Treatment Effect		153.889	140.116	14.007

Source: Author's Construct 2019.

Considering the overall model from table 5, had receiving households not received food, their average FIES would have increased by 2.009 points, with expected FIES of 1.549 points if non-receipt households received food transfer. Likewise, food receivers have expected food consumption score of 133.3 if they had not received whereas the expected FCS of non-receivers is 137.1 if they had received food. The likelihood of being food insecure on the average increases by 0.307 for rural receivers if they do not receive and decreases by 6.146 for non-receivers should they receive. Consistent with predictions from conceptualisation of food security, food assistance has proven worthy in decreasing food insecurity experience among households. Frayne *et al.* (2010) reached a similar conclusion using the AFSUN Urban Food Security Baseline Survey, where food receiving households are less food insecure

For the urban sample, receivers on the average decrease their food insecurity status by 0.341 if they had not received, and averagely decrease FIES by 0.666 if non-receivers had received. Although both receivers and non-receiver have negative FIES values, the expected reducing effect is greater for receiving relative to not receiving. The results from the FCS model significant effect for receiving (153.9) compared to food consumption score of 140.1 if households had not received food. The findings of Crush (2013) emphasised that food transfers reduced the food insecurity experience of urban households. Similarly, Djurfeldt and Wambugu (2011) corroborate this finding by indicating that urban households use food received to ingest sufficient food access to other

food groups besides cereals and crops. The results presented in table 5 shows that food remittance has a significant impact on food security outcomes and again the impact among rural households is greater than the effect experienced by urban households. The significant decrease in food insecurity among rural households exemplifies the area's susceptibility to changes in livelihoods, which in general shows how they acknowledge food sent to them.

Conferring to the impact of food remittance on FIES, the transitional heterogeneity effects portrayed negative values for the three model; 3.558, 6.453 and 0.324 for the overall, rural and urban models respectively, depicting reducing the impact of food remittance on food insecurity. Households that receive food experience less food insecurity experience compared to non-receivers; which is consistent with the results from propensity score matching. Likewise, households that receive are able to improve their FCS, which is evident in the positive transitional heterogeneity effects across the three models (3.85, 2.944 and 14.0 for the overall, rural and urban models respectively). The result shows that the mean FCS for food receivers is statistically higher than had they had not received. Unlike PSM results which compared the receivers and non-receivers based on observed variables, the result from switching regression confirms a significant positive impact of food remittance on FCS among urban households, after controlling for unobservable factors.

Relative Effect of Food and Cash Remittance on Household Food Security

In order to analyse the effect of the amount of food and cash remittance on household food security, instrumental variable estimation was used to account for the biases and inconsistency from OLS estimation due to the problem of endogeneity. Hereafter, the study presents findings on the effect of

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food remittance verse the effect of cash remittance on food security. Besides food and cash transfer, the study controlled for correlates of household food security outcomes. The first and fifth column of table 5 shows OLS results for food received and amount of cash received respectively. The study seeks to hinge on the results from the instrumental variable model. The study considered the validity of instruments by conducting the under-identification, over-identification and weak identification tests. The test statistics were significant for all models; implying the instruments used are valid. The results for the post-estimation is shown in the Appendix G.

Table 6: Relative effect of Food and Cash Received on Household Food Security

VARIABLES	(1) TOTAL FIES_OLS	(2) TOTAL FIES_IV	(3) URBAN FIES_IV	(4) RURAL FIES_IV	(5) TOTAL FIES_OLS	(6) TOTAL FIES_IV	(7) URBAN FIES_IV	(8) RURAL FIES_IV
Amount of Food received	-0.001***	-0.002**	-0.002	-0.003*				
	(0.000)	(0.001)	(0.00142)	(0.00141)				
Amount of Cash received					0.001***	-0.001***	-0.001**	-0.001***
					(0.000)	(0.000)	(0.000)	(0.000)
Male Headed Household	-0.209***	-0.184**	-0.158	-0.294***	-0.206***	-0.209**	-0.0147	-0.464***
	(0.073)	(0.08)	(0.122)	(0.105)	(0.072)	(0.101)	(0.158)	(0.119)
Urban Residence	-0.610***				-0.571***			
	(0.066)				(0.0661)			
Head_Age	-0.001	0.002	0.004	-0.000	-0.001	0.000	0.001	-0.002
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)
Household size	0.05***	0.04**	0.062**	0.02	0.053***	0.064***	0.113***	0.026
	(0.013)	(0.016)	(0.029)	(0.019)	(0.013)	(0.02)	(0.035)	(0.019)
Married	-0.224***	-0.235***	-0.283**	-0.241**	-0.215***	-0.144	-0.261*	-0.040
	(0.0741)	(0.0834)	(0.122)	(0.121)	(0.0736)	(0.104)	(0.154)	(0.116)
Employed	-0.228***	-0.367***	-0.340*	-0.471***	-0.238***	-0.490***	-0.550**	-0.323***
	(0.0698)	(0.117)	(0.187)	(0.140)	(0.0698)	(0.119)	(0.229)	(0.105)
Access to credit	-0.120	-0.039	0.124	-0.215*	-0.098	0.138	0.541*	-0.137
	(0.1)	(0.106)	(0.191)	(0.128)	(0.095)	(0.144)	(0.278)	(0.135)
Household head ever schooled	-0.677***	-0.791***	-0.881***	-0.602***	-0.653***	-0.453***	-0.521**	-0.381***
	(0.082)	(0.090)	(0.161)	(0.109)	(0.082)	(0.129)	(0.236)	(0.125)

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Dependency ratio	0.136***	0.180***	0.191***	0.152***	0.133***	0.133***	0.147*	0.134***
	(0.031)	(0.040)	(0.066)	(0.051)	(0.031)	(0.047)	(0.078)	(0.048)
Religion of HH(ref: None)								
Christian	-0.671***	-0.689***	-0.997***	-0.471**	-0.647***	-0.401*	-0.461	-0.416**
	(0.150)	(0.161)	(0.310)	(0.197)	(0.148)	(0.214)	(0.395)	(0.201)
Islam	-0.824***	-0.988***	-1.258***	-0.631***	-0.805***	-0.644***	-0.736*	-0.616***
	(0.165)	(0.183)	(0.377)	(0.228)	(0.163)	(0.239)	(0.432)	(0.232)
Traditionalist	-0.589***	-0.553***	-0.258	-0.474**	-0.568***	-0.376	0.0222	-0.429*
	(0.171)	(0.200)	(0.516)	(0.223)	(0.169)	(0.257)	(0.651)	(0.233)
others	0.207	-0.00816	0.637	-1.157	0.184	-0.227	0.644	-1.385
	(0.775)	(0.839)	(1.200)	(1.210)	(0.773)	(1.069)	(1.476)	(1.271)
Ethnicity of HH(ref: Akan)								
Ga-Adagme	-0.818***	-0.631***	-0.620***	-0.539*	-0.845***	-0.889***	-0.905***	-0.690***
	(0.134)	(0.176)	(0.212)	(0.326)	(0.133)	(0.193)	(0.288)	(0.237)
Ewe	0.167*	0.265***	0.130	0.360***	0.137	-0.0795	-0.213	0.108
	(0.093)	(0.101)	(0.153)	(0.138)	(0.093)	(0.140)	(0.229)	(0.145)
Guan	0.445***	0.491***	0.489*	0.524***	0.428***	0.219	0.309	0.337
	(0.157)	(0.165)	(0.291)	(0.200)	(0.156)	(0.216)	(0.373)	(0.215)
Gurma	0.147	0.119	-0.288	0.387*	0.130	-0.092	-0.646	0.245
	(0.156)	(0.188)	(0.375)	(0.226)	(0.156)	(0.244)	(0.501)	(0.241)
Mole-Dagbani	0.116	0.110	0.122	0.259	0.102	-0.032	0.153	0.052
	(0.135)	(0.150)	(0.254)	(0.196)	(0.135)	(0.193)	(0.321)	(0.212)
Grusi	0.353**	0.317	-0.562	0.743***	0.341**	0.133	-0.561	0.498*
	(0.162)	(0.205)	(0.382)	(0.247)	(0.161)	(0.260)	(0.456)	(0.266)
Mandi	-0.153	-0.123	-0.267	0.001	-0.168	-0.365	-0.694	-0.016
	(0.295)	(0.365)	(0.694)	(0.429)	(0.296)	(0.467)	(0.857)	(0.449)
Others	0.205	0.200	-0.226	1.022**	0.162	-0.199	-0.484	0.567
	(0.261)	(0.289)	(0.414)	(0.430)	(0.263)	(0.381)	(0.534)	(0.446)
Ecological zone								

Ref: coastal

Forest	-0.737***	-0.637***	-0.510***	-0.877***	-0.740***	-0.721***	-0.632***	-0.720***
	(0.079)	(0.086)	(0.121)	(0.126)	(0.079)	(0.106)	(0.153)	(0.136)
Savanah	0.700***	0.852***	0.710***	0.544***	0.682***	0.549***	0.354	0.613***
	(0.138)	(0.148)	(0.235)	(0.200)	(0.138)	(0.194)	(0.330)	(0.211)
Constant	1.796***	1.773***	1.656***	2.189***	1.796***	2.080***	1.474***	2.338***
	(0.220)	(0.289)	(0.558)	(0.323)	(0.219)	(0.315)	(0.539)	(0.318)
Observations	4,671	4,671	2008	2,663	4,671	2008	2663	4,671

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

Source: Author's Construct 2019.

From table 6, columns 2, 3 and 4 present the results of the food remittance and 6, 7 and 8 present results of cash remittance for the overall, urban and rural households respectively. FCS results are shown in Appendix F.

The results show a reducing effect of the amount of food and cash received in their respective model on household food insecurity experience scale. While the effect was significant for all the amount of cash received specific models, the urban food-specific model showed insignificant results, although the coefficient has the expected sigh. Explicitly, an additional cedi value of food received in the rural household model reduces food insecurity experience by 0.003 which is higher among the three models, although weakly significant (90 percent confidence interval). Although the cash effect is highly significant, the magnitude of effect, 0.001, is small compared with an increase in the amount of food (0.003). For the overall model, should the amount of food received increase by a cedi, household food insecurity falls by 0.002 points relative to experiencing 0.001 decrease with a cedi increase in the amount of cash received. Comparatively, the magnitude of effect for the FCS in is larger with an increase in the amount of food received for the overall and rural models relatives to an additional amount of cash received.

On the correlates for the food-specific model, heads of households who are married, educated, employed significantly reduces food insecurity across all three models. For employed household head, the reducing effect is larger in the rural household model relative to urban educated household heads. Except for the urban model where male-headed does not significantly reduce food insecurity, food insecurity reducing effect is expressively felt among the overall households and rural model; with greater effect among rural households.

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Likewise, households in the forest zone compared to those within the coastal zone experience lower food insecurity results. Compared to the Akan ethnic group, only Ga-Adagme group reduces food insecurity across the three models. Households belonging to Christian, Islam and traditional religious group likewise possess reducing insecurity magnitudes across all models. Correlates such as dependency, household size; retain positive values which imply an increase in household food insecurity status. Consistent with the food-specific model, correlates effects in the cash specific models are more or less similar.

The study further examines the effect of the amount of food transfer concurrently with that of cash remittance in the same model to accentuate their respective effect. Table 7 shows the overall model comprising the amount of food and cash received to unfold the magnitude of effect with regards to each variable, and further present and explain the findings of other correlates of food security outcome.

Table 7: Effect of Food Remittance on Household Food Security Outcomes

VARIABLES	Food Insecurity Experience Scale (FIES)				Food Consumption Score (FCS)		
	(1) OLS	(2) IV_TOTAL	(3) IV_URBAN	(4) IV_RURAL	(5) IV_TOTAL	(6) IV_URBAN	(7) IV_RURAL
Amount of Food received	-0.0001**	-0.004**	-0.003*	-0.002	0.005	0.108**	0.227**
	(0.00)	(0.001)	(0.002)	(0.003)	(0.035)	(0.055)	(0.100)
Amount of Cash received	0.001***	0.001	0.000	-0.001**	0.003	-0.005	0.019*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.005)	(0.010)
Male Headed Household	-0.208***	-0.224**	-0.124	-0.335***	-13.86***	-15.25***	-9.446**
	(0.072)	(0.099)	(0.148)	(0.125)	(2.307)	(5.304)	(4.502)
Urban Residence	-0.569***	-0.418***			7.052***		
	(0.0661)	(0.102)			(2.373)		
Head_Age	-0.001	0.005	0.007	-0.002	0.056	-0.112	0.281*
	(0.001)	(0.003)	(0.005)	(0.004)	(0.074)	(0.167)	(0.154)
Household size	0.052***	0.027	0.059	0.025	7.013***	10.97***	4.598***
	(0.013)	(0.021)	(0.037)	(0.023)	(0.497)	(1.323)	(0.817)
Married	-0.217***	-0.265***	-0.303**	-0.119	14.61***	15.67***	3.901
	(0.074)	(0.102)	(0.135)	(0.159)	(2.367)	(4.834)	(5.698)
Employed	-0.247***	-0.561***	-0.418**	-0.478**	13.84***	20.98***	-2.682
	(0.07)	(0.133)	(0.167)	(0.220)	(3.095)	(5.953)	(7.911)
Access to credit	-0.1	-0.037	0.211	-0.00361	7.137**	3.004	14.91***
	(0.095)	(0.141)	(0.253)	(0.148)	(3.271)	(9.030)	(5.309)

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Religion of HH(ref: None)							
Christian	-0.646***	-0.598***	-0.991***	-0.310	2.384	0.492	14.14*
	(0.149)	(0.201)	(0.370)	(0.226)	(4.669)	(13.23)	(8.114)
Islam	-0.806***	-0.952***	-1.383***	-0.554**	5.330	3.906	10.82
	(0.164)	(0.231)	(0.435)	(0.256)	(5.352)	(15.53)	(9.204)
Traditionalist	-0.572***	-0.571**	-0.254	-0.272	-3.052	-21.79	4.417
	(0.170)	(0.246)	(0.569)	(0.255)	(5.713)	(20.34)	(9.171)
Others	0.172	0.170	0.500	-1.278	3.059	12.05	4.834
	(0.772)	(1.033)	(1.261)	(1.586)	(23.98)	(45.05)	(56.95)
Ethnicity of HH(ref:Akan)							
Ga-Adagme	-0.830***	-0.560**	-0.717***	-0.308	24.41***	26.29***	45.81***
	(0.133)	(0.224)	(0.246)	(0.472)	(5.189)	(8.787)	(16.97)
Ewe	0.141	0.254*	0.152	-0.114	-3.323	-2.815	-3.706
	(0.0926)	(0.145)	(0.201)	(0.203)	(3.363)	(7.177)	(7.284)
Guan	0.428***	0.396*	0.515	0.354	6.861	17.59	-18.42**
	(0.156)	(0.203)	(0.340)	(0.224)	(4.718)	(12.16)	(8.042)
Gurma	0.127	0.102	-0.031	0.696***	-9.349*	-6.826	-44.47***
	(0.156)	(0.233)	(0.437)	(0.229)	(5.403)	(15.63)	(8.209)
Mole-Dagbani	0.1	0.073	0.198	0.754***	-7.559*	-1.964	-53.78***
	(0.135)	(0.181)	(0.289)	(0.163)	(4.212)	(10.31)	(5.842)
Grusi	0.335**	0.0290	-0.782*	1.136***	-18.15***	-15.19	-60.22***
	(0.161)	(0.257)	(0.420)	(0.254)	(5.968)	(15.00)	(9.132)
Mandi	-0.168	-0.0852	-0.283	0.636	-4.695	-14.47	-43.09***
	(0.295)	(0.437)	(0.796)	(0.452)	(10.16)	(28.43)	(16.23)
Others	0.164	0.389	-0.08	1.015*	-9.633	-13.59	-6.045
	(0.262)	(0.359)	(0.464)	(0.570)	(8.345)	(16.57)	(20.47)
Ecological zone Ref: coastal							
Forest	-0.737***	-0.657***	-0.556***			-16.45***	-25.21***

	(0.079)	(0.106)	(0.137)		(2.450)	(4.905)	
Savanah	0.685***	0.645***	0.595**		-55.71***	-60.38***	
	(0.138)	(0.183)	(0.277)		(4.248)	(9.881)	
Household head ever schooled	-0.655***	-0.728***	-0.847***	-0.627***	4.712*	11.42	4.203
	(0.0820)	(0.123)	(0.209)	(0.142)	(2.860)	(7.476)	(5.096)
Dependency ratio	0.135***	0.207***	0.225***	0.173**	1.975	0.816	5.128**
	(0.0311)	(0.0519)	(0.0748)	(0.0694)	(1.205)	(2.672)	(2.490)
Constant	1.812***	2.208***	1.711***	2.159***	87.14***	81.69***	90.13***
	(0.219)	(0.318)	(0.539)	(0.361)	(7.386)	(19.25)	(12.96)
Observations	4,671	4,671	2008	2,663	4,671	2008	2663

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

Source: Author's Construct 2019.

The first column of table 7 gives us OLS estimates of the food insecurity experience scale, with column 2, 3 and 4 showing the results from FIES for the overall, urban and rural models respectively. Column 5 shows the FCS results for the overall model with column 6 and 7 showing urban and rural FCS results respectively. On the effect of the amount of food received on FIES, both the OLS and IV shows a decreasing effect and significant relationship between food remittance and food security. Likewise, a positive effect is confirmed with the amount of food received on FCS, although not significant for the overall model.

With overall IV model, an additional amount of food received by a household reduce their food insecurity by 0.004 at 5 percent alpha value. This implies that households may be less worried, anxious, apprehensive over getting enough food to eat. Considering the rural-urban variation, urban model coefficient shows that if the amount of food receive should increase by one cedi, household food insecurity experience will reduce by 0.003 points. Findings from Crush and Caesar (2017) corroborate with this finding and revealed larger vulnerability reducing- effect of food remittance among urban households. Remarkably, the sign in the FCS is consistent with FIES in terms of meaning across all three model for the amount of food received. The positive FCS value implies households can supplement their available food with the food received which does not only diversify food but also smoothen their food consumption. The FCS coefficient of 0.108 points is statistically significant implying a positive effect of food remittance on household food security. For the rural model, the amount of food received statistically does not affect food insecurity, though the directional effect is revealed. Nevertheless, the FCS from the rural

model increases by 0.227 which is about twice the effect felt among urban households with an additional amount of food received. Consistent with existent literature, Crush and Ceaser (2017); Tawodzera and Crush (2016) concluded that rural households are able to diversify their consumption with food received.

From the OLS model, the amount of cash received significantly reduces food insecurity for the overall model whereas the IV results show varying results. Regardless of the significance level, the FIES results for all three model has the expected sign of decreasing food insecurity. As Kuuire *et al.* (2013) noted, cash remittance is necessary but not sufficient in combating household food insecurity. Across all model, the rural model for both FCS and FIES showed significant results. With an additional amount of cash received, rural households reduce food insecurity by 0.005 points at 95 percent confidence interval and likewise increase their food consumption score by 0.019 points at 10 percent significance level. The result makes intuitive sense considering the social-economic make-up of most rural households. The implication from the finding is that urban household merely receiving cash does not translate into positive food security status unless recipients are equipped with the use of cash in relation to food consumption. Relatively, it could be implied that rural households use cash transfer on daily consumption than urban households where household decrease consumption instability and further stimulates the amount of food available with the cash they receive.

On the correlates of FIES and FCS, the study noticed that the coefficient of male-head households significantly explains FCS and FIES across all three models. Male-headed households are more likely to reduce food insecurity by 0.21 points compared to their female counterparts in the OLS model. Given the

more consistent model, the IV model for the total households' shows that male-headed households experience less insecurity of 0.224 points compared with female-heads. Ebadi *et al.* (2018) confirmed that male-heads were more food secure than females in the Global South countries, regardless of region. This conforms to the findings of Babatunde *et al.* (2011) whiles analysing food security across gender in Nigeria. Birkenmaier, Huang and Kim (2016) concluded that male-heads are more likely to engage in high income earning economic activities which makes them experience less insecurity relative to their female counterpart given their accrued resources. For the FCS model, male heads have less consumption score compared to female-heads. If a household head is male, the FCS of the household reduces by almost 13.86, 9.446 and 15.25 points for the total, rural and urban model respectively compared to when the head is female. Abafita and Kim (2014) confirmed that male-headed households were less food secured than their female-headed counterparts whiles examining the determinants of household food security in rural Ethiopia. The relative magnitude could be due to nutrition awareness that women have as well as their caregiving and food preparation activities. Also, the recent low poverty status of female relative to that of the male from the GSS explains why food content of female-headed household is diversified with nutrients.

For residence, urban households are less insecure compared to rural households. The coefficient of -0.569 from the OLS model shows that urban households reduce food insecurity of about 0.569 points compared to households in rural areas. The IV models show 0.418 fall in food insecurity by urban households relative to rural households. Fairly, the urban residence has a positive FCS which implies an increase in consumption by 7.052 relative to their

rural counterpart. Studies from other settings corroborate this finding and it includes studies by Ebadi *et al*. (2018); Abadi *et al.* (2018), which revealed that urban dwellers have larger nutritious status than rural dwellers.

On the effect of age of household heads, only the rural model had significant values for FCS, although the significant level is weak. At a 10 percent significance level, rural household heads increase their food consumption by 0.281 points relative to urban household heads. This implies that an additional year of the head provides a superior experience in resorting to measures that could diversify food sources. Arene and Anyaeji (2010) revealed this positive correlation between age and food security where matured household heads have been argued to have better access to capital and high experience in occupations; which turns to improve their returns compared to younger heads.

From table 7, the findings show that household size significantly explains FCS, not FIES. Although the coefficient is not significant across all FIES models, the positive coefficients imply that household size has a worsening effect on food insecurity. Thus, there is a tendency for households to be food insecure as its member increases. The positive sign from the FCS models shows that if household size increase by one more person, the consumption score of the household would increase. The positive effect of household size on FCS is expected since more members in the households are likely to eat more food which would comprise higher consumption score.

The OLS estimates showed that the nutritional component of food by married household heads has an indirect relationship with food insecurity. For the IV model, marital status of household heads significantly affects FIES and

FCS of the overall and urban households. For both FCS and FIES in the overall and urban cases, the results indicate that married households have lesser insecurity experience and larger food scores compared to their counterparts. This finding supports the results from Tsegaye *et al.* (2015) who expressed that married heads were four times less likely to be food insecure compared to single household heads. In the IV models for FIES, married heads have FIES of 0.265 and 0.303 points less than non-married heads for the total and urban model respectively. The relative consumption score for married heads in the overall model is 14.61 compared to 15.67 from the urban model. Duval and Wolff (2013) attributed this to the possibility of joint resources by couples which augments the quantity and quality of food consumed, which further intensify their nutritional intake. Nevertheless, this result contradicts with the findings of Sekhampu (2017) where married heads are less secured compared to single-household heads. The argument here stemmed from the fact that marriage reduced the likelihood of being food secure and that married couples had an additional person to feed, thus increasing resource burden of household.

This study also finds a negative and significant relationship between employment status and FIES. The sign is consistent across the different models. In effect, if all other factors are held constant, there is a tendency for households whose heads are employed to experience less food insecurity. Thus, one would expect sufficiency and constancy in the quantity and quality food intake of such households. For instance, the IV model for the overall case reports a coefficient of -0.56 which depict a fall in food insecurity for employed heads compared to unemployed heads. Urban heads who are employed relatively experience less food insecurity of about 0.418, with a coefficient of 0.478 for rural heads. Abadi

et al. (2018) confirmed this finding among household in Tigray, Ethiopia. Likewise, the meaning of the results from FIES is consistent with findings from the overall and urban FCS model. Bruening *et al.* (2017) indicated that employed head is able to provide enough food for their households than employed head relative to their economic stance. Drawing from these results, one can say that nutritional deficit is more likely to be associated with households with unemployed heads.

Considering the relationship between access to credit and food security outcomes, the results show that households with access to credit are able to improve food security given the positive consumption score than their counterparts who did not. Conspicuously, the findings only hold for the total households and the rural model. Thus, for urban households, access to credit does not necessarily improve the food security status of households. The FIES estimates on the average had the expected sign relative to credit access, yet the coefficients are not statistically significant. For the FCS model, the coefficient of 7.137 is significant at 5 per cent alpha value for the overall case indicates that household who have access to credit increase their consumption by 7.137 points. The rural household coefficient of 14.91 which is twice as the coefficient for the overall case lies within 99 percent confidence interval. This corroborates with the findings of Annim and Frempong (2017) which established that credit unwinds purchasing constraints and smoothen household consumption thereby improving household the food security status.

The results in Table 7 show a positive effect of education status of household heads on household food security outcomes. While this effect was significant for all FIES models, it was significant for only the overall FCS

model. Educated household heads experience less food insecurity with coefficients of -0.728, -0.847 and -0.627 for the total, urban and rural models respectively. This finding is consistent with the results of Babatunde *et al.*, (2011) who discovered that household heads with higher education are more likely to ensure food security among households in North Central Nigeria. Regmi and Paudel (2017) findings also support the argument that educated household heads less susceptible to food insecurity compared to uneducated heads. In response to this finding, Bruening (2017) argued that low levels of education limit the ability to pursue higher earning job opportunities, and that educated household head can explore better employment avenues to increase income. The overall FCS value of 4.712 was significant at 10 percent alpha level given that the household head is educated.

The level of dependency in a household correlates with both FIES and FCS from the results presented in table 7. The result on the dependency ratio gives a causal effect with the number of dependents in households and their respective household food insecurity status. When the number of dependents in a household increase by one additional person, food insecurity increase by O.135 and 0.207 for the total OLS and IV model respectively. Comparative, the one more dependent in an urban household increases food insecurity experience by 0.225 points with rural households experiencing 0.173 increase in food insecurity. The coefficients were statistically significant for all the FIES model with a 5 percent significance level for the rural and total sample and 1 percent significance for the urban model. Whiles analysing the associated factors of household food insecurity in Wolaita Sodo, Tsegaye *et al.* (2015) discovered that the higher the dependents in the household, the worse the household food

insecurity due to inadequate income to ensure sufficient food for all. With FCS, only rural households had a significant coefficient of 5.128 which represent an increase in consumption as the number of dependent increases.

With the Akan as the reference ethnic group, the results show that significant differences exist in food consumption across the different ethnic groups in Ghana. For instance, Ga-Adagme heads experience less food insecurity which is significant for the overall and urban model and likewise have a positive consumption score across all three cases. Like Annim and Frempong (2017), the study revealed that households headed by a Grusi have less nutritious diet given their FCS relative to households headed by an Akan. The results also showed that Christians and Muslims had lower insecurity scores than those in no religious group. The total case for the traditionalist group is statistically significant with a coefficient of -0.571 implying lower levels of insecurity. Notably, the FCS for all case was not significant for all religious groupings except for rural Christians. Intuitively, the finding surmises the idea of charitable behaviour among the religious group. To confirm this finding, Duval and Wolff (2013) presented evidence of church members being capable of building social networks where low-income households mostly receive cash and in-kind food assistance to cope food insecurity.

The study also found differences in food security outcome across the ecological zone. With the coastal zone as the reference zone, households located in forest zone experience less food insecurity status whereas households within the Savanah belt experience higher levels of food insecurity. With the FCS, forest zone households consume less diversified and nutrition diet (16.45)

compared to households in the coastal zone. The Savanah zone has FCS of -55.7 which depict lower levels of nutritious food relatively.

Post Estimation Test Results

For the OLS models, series of robustness check were conducted and the test results are presented in Appendix H. With a VIF less than 10 for all models, the study concludes that the model does not suffer from multicollinearity. Based on the Ramsey RESET test, the study rejects the null hypothesis that there is no omitted variable for the total and cash-specific model. The test output for the Link test shows that the square of the expected dependent variable has no explanatory power. From the diagnostics regression results, the study concluded that OLS estimates are not consistent and that IV is ideal.

Under-identification test was conducted for the IV model to see whether the excluded instrument correlates with the endogenous regressors. Across all specified models, the study rejected the null of under-identification and argue that the matrix has full rank and the equation is identified. To check that the models do not suffer from weak identification, we conducted a weak identification test. In all models, the F statistic exceeds the Stock-Yogo weak identification critical values at 5 percent maximal. The study, therefore, concludes that these models do not have weak identification problem. The study further conducted the Sargan test of over-identification. The study failed to reject the null hypothesis that instruments are identified for all models given the p-values. The test results are presented in Appendix H.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The study examined the relative effect of food and cash remittance on household food security in Ghana. Specifically, the study explored the spatial distribution of food security across 216 districts in Ghana; examined the impact of food remittance on household food security and the relative effects of food remittance on food security outcomes. This chapter captures the summary of the findings that were made from the study. It goes on to provide conclusions made from the study and thereafter gave recommendations to various stakeholders in the country based on the findings and conclusions. The chapter ends with the limitations of the study and also gave directions for further research on the topic.

Summary of the Study

The current headway of food security as an operational model in policy analysis has echoed its wider recognition and likewise informed the need for significant drivers for investigating the concept. It is in this regards this study pursued to contribute, by looking at yet another pathway to achieve household food security, against the backdrop of remittance and food security. The study reviewed theoretical issues in the conceptualisation and measurements of food security. The study was grounded in Sen's Entitlement theory which gives a theoretical perspective on food security and further reviewed related empirical literature on food security. Food security as a multidimensional issue has been defined and measured differently based on the focus of one's study and similarly the data available. The study employed the Food Insecurity Experience Scale

(FIES), constructed from eight questions using PCA and Food Consumption Score, which assigns nutritional weights to food items. The study used cross-sectional household-level data from the seventh round of the Ghana Living Standard Survey (GLSS).

Understanding the difference in food security status across districts, the study provides evidence that food security status is spatially bounded. Consequently, the study specifically explored food security outcomes across 216 districts in Ghana. With spatial autocorrelation analysis, the study revealed clustering of food security outcomes among some districts in Ghana. The results from spatial findings using the two different measures of food security revealed that there is significant spatial variation in food security outcomes across space in Ghana. The findings indicated that most districts in the northern, south-western, and pocket areas in other parts of the country have relatively high food insecurity experience, and provides evidence that food insecurity is more prevalent in high-poverty areas, less resource endowed places and less-privileged areas in terms of economic opportunities. Aside these districts, some districts in the food dominance zone of the country have high food insecurity outcome in terms of the nutritional content of food intake.

Furthermore, the study highlighted the impact of food remittance on household food security, using matching technique to address the issue of selectivity from non-random treatment in the data used. The treatment effect estimates were complemented with the endogenous switching model. The causal impact estimation from both the switching and matching regression suggested that food remittance have significant food security outcomes. Remitted food significantly lower food insecurity experience in the total, rural

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and urban household models with greater impacts felt in the rural household model, even after controlling for confounding factors. For food consumption, food receipt significantly improves the food security status of the total and rural household models. The results from the switching models further confirmed that food remittance has a significant impact on food security outcomes (both FIES and FCS), suggesting the need to control for unobserved heterogeneities.

Considering the objective of analysing the relative effect of the amount of food remittance on food security, IV estimation was employed to account for the biasness and inconsistency from the OLS technique whiles solving the problem of endogeneity. The results from OLS shows that the amount of food received significantly reduce food insecurity. Quite interestingly, the amount of cash received which was significant in the OLS model turned insignificant after accounting for the problem of endogeneity. Regardless, the effect of cash received for rural FCS and FIES models were significant after endogeneity has been accounted for. The magnitude of effect for an additional amount of food received in reducing food insecurity is greater than the effect from an increase in the amount of cash received for rural households. The results from urban and overall model showed dicey effect in terms of significance.

The IV result for household food security outcomes showed that such variables as residence, education and employment of heads positively affect household food security. With the other variables, the effects were quite mixed given the different food security measures. While male-headed households significantly reduce their food insecurity experience, their food consumption score was less compared to female-heads. Quite unexpectedly household size had no significant effect on FIES across all three models,

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whereas it showed a significant positive role in improving food security as measured by the FCS. Likewise, married heads in the urban model significantly reduce food insecurity and improve food consumption relative to rural households. Results from the preferred IV regression indicated that access to credit improves FCS for the total and rural household model, although its effects on FIES was not significant for FIES models. Household food security as measured by FIES was positively related to Christian and Islam heads across all three models. With the exception of the FIES rural estimates, Ga-Adagme heads compared to Akan heads were found to be more food secured.

The observed differences in magnitude and significance of the estimated parameters across the two food security measure were expected since the two indicators are measuring relatively different aspects of household food security.

Conclusion

Given that much discussion on food security focuses on cash remittances, the evidence presented in this study reveals that food remittance contributes significantly to food security. Using both PSM and ESM, the study revealed a significant impact of food remittance on food security outcomes. Comparatively, an additional amount of food received was revealed to have a greater reduction effect on household food insecurity levels than an increase in the amount of cash whiles using the IV estimation. Accordingly, food remittance alleviates overall household budget pressures on food, thus making cash available for other equally essential household needs. The findings revealed

employment strongly affect household food security across all model. The findings revealed that food security could be improved through diversifying socio-economic opportunities such as job creation, promote education, and improve awareness creation on credit utilisation aside expanding of access to credit particularly, in rural areas.

The study supported the claim that introducing space into food security analysis enhances the empirical understanding of both global and local spatial effects on food security outcomes. Using both global and local spatial autocorrelation measures the study revealed significant and positive spatial dependence and clustering of food security outcomes across districts in Ghana. In general, areas that are historically characterised by unfavourable environmental conditions, low socio-economic and welfare outcomes significantly experienced high food insecurity levels. The foregoing dynamics in the spatial variation of food security from the study have coalesced with strengthening livelihood pattern by encouraging food transfer to households in food-insecure districts.

Recommendations

The study posits that food remittance can be explored as a means of improving household food security outcomes in Ghana. Considering the effect of food remittance, it is imperative to broaden remittance policies to include strategies that enhance food transfer. Thus, policies targeted at remittance should be revived to incorporate food transfer. In view of this, the study calls for stepping up policies that facilitate both food and cash transfer such as infrastructure development. Such infrastructures as improved transport networks can facilitate the frequency with which relatives in farther areas can

remit food to enhance household food security. Also, for cash transfer, institutions in charge of money transfer such as telecommunication networks should reduce the charges on money transfer and also make means for transferring and receiving money readily available especially in rural areas.

With the spatial revelation of food insecure zone, the study suggests that food transfers should be targeted towards particularly rural areas in food insecure districts to give such households, the opportunity to invest money in other human development related activities. Targeting food transfer should be perceived and realised in line with national policy program targeted at addressing food insecurity. Proposedly, Ministry of Gender Children and Social Protection should revive the openness of food programs targeted at children to include vulnerable households in food-insecure districts.

Furthermore, the links between food security and remittances; both cash and food, reveal social relation as a useful pathway of devising food insecurity coping mechanisms. Hence, the study recommends that policies that foster social connectedness such as festivals should be targeted to amplify mechanism through which food is sent.

The results from the study imply that food insecurities can be reduced if efforts are made to improve the employment levels of people. In terms of policy recommendations, the study calls on the Ministry of Employment and Labour Relation for local access to jobs, predominantly decent paying jobs, to intensify households' effort to increase their income levels. Thus, there is the need to provide alternate livelihood strategy such as providing cottage industries to improve households' livelihood strategy.

Suggestions for Future Studies

Given the above limitation of the study, future studies should include the kinds of food households receive as well as the means through which they receive to determine if there will be significant changes in household food security outcomes. Secondly, this study considered food security outcomes at the household level, hence, future studies should consider intra-household variation by considering other measures of food security to accentuate the effect of food remittance on individual food security status. With the findings that food insecurity levels clustered across districts, future studies should explore further the spatial processes attributed to the phenomena at the district level; thus, emphasising on place-based research. Future studies should seek to understand the food choices and how these choices are accessible within the specified areas to assess the variation in food need across districts, and likewise direct the content food assistance program. These suggestions give wave that there is ample scope for further research.

REFERENCES

Abadi, N., Techane, A., Tesfay, G., Maxwell, D., & Vaitla, B. (2018). *The impact of remittances on household food security: A micro perspective from Tigray, Ethiopia*. WIDER Working Paper.

Abafita, J., & Kim, K.-R. (2014). Determinants of household food security in rural Ethiopia: An empirical analysis. *Journal of Rural Development/Nongchon-Gyeongje*, *37*(1071-2016–86950), 129.

Adams Jr, R. H. (2011). Evaluating the economic impact of international remittances on developing countries using household surveys: A literature review. *Journal of Development Studies*, *47*(6), 809–828.

Adams Jr, R. H., & Cuecuecha, A. (2010). Remittances, household expenditure and investment in Guatemala. *World Development*, *38*(11), 1626–1641.

Adams Jr, R. H., & Cuecuecha, A. (2013). The impact of remittances on investment and poverty in Ghana. *World Development*, *50*, 24–40.

Agidew, A. A., & Singh, K. N. (2018). Determinants of food insecurity in the rural farm households in South Wollo Zone of Ethiopia: the case of the Teleyayen sub-watershed. *Agricultural and Food Economics*, *6*(1), 10.

Ahmadi, D., Amarnani, E., Sen, A., Ebadi, N., Cortbaoui, P., & Melgar-Quiñonez, H. (2018). Determinants of child anthropometric indicators in Ethiopia. *BMC Public Health*, *18*(1), 626.

Ahmed, I. (2013). *Social safety nets in Bangladesh*. Citeseer.

Aidoo, R., Mensah, J. O., & Tuffour, T. (2013). Determinants of household food security in the Sekyere-Afram plains district of Ghana. *European Scientific Journal*. Citeseer.

Akobeng, E. (2017). Safety net for agriculture: effect of idiosyncratic income shock on remittance payments. *International Journal of Social Economics*, *44*(1), 2–20.

Almalki, S. (2016). Integrating Quantitative and Qualitative Data in Mixed Methods Research–Challenges and Benefits. *Journal of Education and Learning*, *5*(3), 288–296.

Andersson Djurfeldt, A. (2015). Multi-local livelihoods and food security in rural Africa. *Journal of International Development*, *27*(4), 528–545.

Annim, S. K., & Frempong, R. B. (2018). Effects of access to credit and income on dietary diversity in Ghana. *Food Security*, *10*(6), 1649–1663.

Arene, C. J., & Anyaeji, R. C. (2010). Determinants of food security among households in Nsukka Metropolis of Enugu State, Nigeria. *Pakistan Journal of Social Sciences*, *30*(1), 9–16.

Atuoye, K. N., Kuuire, V. Z., Kangmennaang, J., Antabe, R., & Luginaah, I. (2017). Residential remittances and food security in the Upper West Region of Ghana. *International Migration*, *55*(4), 18–34.

Babatunde, R. O., & Martinetti, E. C. (2011). Impacts of migrant remittances on food security and nutrition of Farming Households in Kwara State, Nigeria. *Contributed Paper for the International Conference: Shocks in Developing Countries*.

Babatunde, R. O., Omotesho, O. A., & Sholotan, O. S. (2007). Socio-economic characteristics and food security status of farming households in Kwara State, North-Central Nigeria. *Pakistan Journal of Nutrition*, *6*(1), 49–58.

Barrett, C. B. (2002). Food security and food assistance programs. *Handbook of Agricultural Economics*, *2*, 2103–2190.

Barrett, C. B. (2010). Measuring food insecurity. *Science*, *327*(5967), 825–828.

Bashir, Muhammad Khalid, & Schilizzi, S. (2013). Determinants of rural household food security: a comparative analysis of African and Asian studies. *Journal of the Science of Food and Agriculture*, *93*(6), 1251–1258.

Bates, R. H. (2000). Ethnicity and development in Africa: A reappraisal. *American Economic Review*, *90*(2), 131–134.

Battersby, J. (2017). MDGs to SDGs–new goals, same gaps: the continued absence of urban food security in the post-2015 global development

Becker, S. O., & Ichino, A. (2002). Estimation of Average Treatment Effects Based on Propensity   Scores. The Stata Journal, 2(4), 358–377.agenda. *African Geographical Review*, *36*(1), 115–129.

Birkenmaier, J., Huang, J., & Kim, Y. (2016). Food insecurity and financial access during an economic recession: Evidence from the 2008 SIPP. *Journal of Poverty*, *20*(2), 194–213.

Bro, R., & Smilde, A. K. (2014). Principal component analysis. *Analytical Methods*, *6*(9), 2812–2831.

Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: a systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics*, *117*(11), 1767–1791.

Buller, A. M., Hidrobo, M., Peterman, A., & Heise, L. (2016). The way to a man's heart is through his stomach? Mixed methods study on causal mechanisms through which cash and in-kind food transfers decreased intimate partner violence. *BMC Public Health*, *16*(1), 488.

Burchi, F., & De Muro, P. (2012). A human development and capability approach to food security: Conceptual framework and informational basis. *Background Paper*, *8*.

Burchi, F., Scarlato, M., & d'Agostino, G. (2016). Addressing Food Insecurity in Sub-Saharan Africa: The Role of Cash Transfers. *Poverty & Public Policy*, *10*(4), 564–589.

Cafiero, C., Nord, M., Viviani, S., Del Grossi, E., Ballard, T., Kepple, A., … Nwosu, C. (2016). Voices of the Hungry. *Methods for Estimating Comparable Prevalence Rates of Food Insecurity Experienced by Adults throughout the World*.

Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, *22*(1), 31–72.

Cameron, A. Colin, & Trivedi, P. K. (2010). Microeconometrics using Stata, revised edition. *StataCorp LP*.

Campbell, E. K. (2010). The role of remittances in Botswana: Does internal migration really reward sending families? *Population, Space and Place*, *16*(2), 151–164.

Capone, R., Bilali, H. E., Debs, P., Cardone, G., & Driouech, N. (2014). Food system sustainability and food security: connecting the dots. *Journal of Food Security*, *2*(1), 13–22.

Carter, D. W., & Milon, J. W. (2005). Price knowledge in household demand for utility services. *Land Economics*, *81*(2), 265–283.

Chege, P. M., Ndungu, Z. W., & Gitonga, B. M. (2016). Food security and nutritional status of children under-five in households affected by HIV and AIDS in Kiandutu informal settlement, Kiambu County, Kenya. *Journal of Health, Population and Nutrition*, *35*(1), 21.

Chen, S. H. (2008). Estimating the variance of wages in the presence of selection and unobserved heterogeneity. *The Review of Economics and Statistics*, *90*(2), 275–289.

Clemens, M. A., Özden, Ç., & Rapoport, H. (2014). Migration and development research is moving far beyond remittances. *World Development*, *64*, 121–124.

Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale for Measurement of Household Food Access: Indicator Guide. *Food and Nutrition Technical Assistance Project, Washington DC. 29pp*.

Coates, J., Swindale, A., & Bilinsky, P. (2016). Household Food Insecurity Access Scale (HFIAS) for measurement of household food access: indicator guide (v. 3). 2007. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development*.

Coates, J. (2013). Build it back better: Deconstructing food security for improved measurement and action. *Global Food Security*, *2*(3), 188–194.

Coates, J., Swindale, A., & Bilinsky, P. (2007a). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development*, *34*.

Coates, J., Swindale, A., & Bilinsky, P. (2007b). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development*, *34*.

Combes, J., Ebeke, C. H., Maurel, M., & Yogo, T. U. (2014). Remittances and working poverty. *The Journal of Development Studies*, *50*(10), 1348–1361.

Crush, J. (2013). Linking food security, migration and development. *International Migration*, *51*(5), 61–75.

Crush, J. (2016). *Migration, development and urban food security*. Southern African Migration Programme.

Crush, J., & Caesar, M. (2017). *Food remittances: rural-urban linkages and food security in Africa*.

Crush, J., & Frayne, B. (2010). *The invisible crisis: Urban food security in Southern Africa*.

d'Agostino, G., Scarlato, M., & Napolitano, S. (2017). Do Cash Transfers Promote Food Security? The Case of the South African Child Support Grant. *Journal of African Economies*, *27*(4), 430–456.

Darfour, B., & Rosentrater, K. A. (2016). Agriculture and food security in Ghana. *2016 ASABE Annual International Meeting*, 1. American Society of Agricultural and Biological Engineers.

Deitchler, M., Ballard, T., Swindale, A., & Coates, J. (2010). *Validation of a measure of household hunger for cross-cultural use.*

Devereux, S. (2001). Sen's entitlement approach: critiques and counter-critiques. *Oxford Development Studies*, *29*(3), 245–263.

Di Falco, S., Veronesi, M., & Yesuf, M. (2011). Does adaptation to climate change provide food security? A micro-perspective from Ethiopia. *American Journal of Agricultural Economics*, *93*(3), 829–846.

Djurfeldt, A. A. (2015). Urbanisation and linkages to smallholder farming in sub-Saharan Africa: Implications for food security. *Global Food Security*, *4*, 1–7.

Djurfeldt, A. A., & Wambugu, S. K. (2011). In-kind transfers of maize, commercialisation and household consumption in Kenya. *Journal of Eastern African Studies*, *5*(3), 447–464.

Duda, I., Fasse, A., & Grote, U. (2018). Drivers of rural-urban migration and the impact on food security in rural Tanzania. *Food Security*, *10*, 785–798.

Duval, L. & Wolff, F.-C. (2013). *The consumption-enhancing effect of remittances: Evidence from Kosovo*. The Vienna Institute for International Economic Studies, wiiw.

Ebadi, N., Ahmadi, D., Sirkeci, I., & Melgar-Quiñonez, H. (2018). The Impact of Remittances on Food Security Status in the Global South. *Remittances Review*, *3*(2), 135–150.

Faber, M., Schwabe, C., & Drimie, S. (2009). Dietary diversity in relation to other household food security indicators. *International Journal of Food Safety, Nutrition and Public Health*, *2*(1), 1–15.

Food and Agriculture Organisation (1983). The State of Food and Agriculture. World Review: The Situation in Sub-Saharan Africa. Rome Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation (1996). Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November. Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation (2015). *The State of Food Insecurity in the World*, 1–62. Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation (2016). Republic of Ghana. Country Programme Evaluation. *FAO Statistical Yearbook*. Rome.

Food and Agriculture Organisation (2016). Voice of Hungry. Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation (2017). Strategic Work of FAO to Increase the Resilience of Livelihoods. Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation, International Fund for Agricultural Development, United Nations Children's Fund, World Food Programme and World Health Organisation (2017). The State of Food Security and Nutrition in the World 2017: Building resilience for peace and food security. Rome: Food and Agriculture Organisation.

Food and Agriculture Organisation, International Fund for Agricultural Development and World Food Programme (2015). Achieving Zero Hunger: The critical role of investments in social protection and agriculture. Rome: Food and Agriculture Organisation.

Food Security Information Network (2018). Global Report on Food Crises 2017. Retrieved from https://docs.wfp.org/api/documents/WFP0000069227/download/?_ga= 2.174769446.522199885.1559819574-1879786635.1553510063

Feleke, S. T., Kilmer, R. L., & Gladwin, C. H. (2003). Determinants of food security in southern Ethiopia. *Global Food Security*, *8*, 1–3.

Frayne, B., Pendleton, W., Crush, J., Acquah, B., Batersby-Lennard, J., Bras, E., Kroll, F. (2010). *The state of urban food insecurity in southern Africa.*

Generoso, R. (2015). How do rainfall variability, food security and remittances interact? The case of rural Mali. *Ecological Economics*, *114*, 188–198.

Gentilini, U. (2016). *The Other Side of the Coin: The Comparative Evidence of Cash and In-Kind Transfers in Humanitarian Situations?* The World Bank.

Ghana Statistical Service (2018). Ghana Living Standards Survey Round 7 (GLSS7): Poverty Report. Accra: Ghana Statistical Service (GSS).

Hayashi, F. (2000). Econometrics. 2000. *Princeton University Press. Section*, *1*, 60–69.

Heckman, J. J. (2001). Econometrics and empirical economics. *Journal of Econometrics*, *100*(1), 3–5.

Heckman, J. J., Ichimura, H., & Todd, P. (1998). Matching as an econometric evaluation estimator. *The Review of Economic Studies*, *65*(2), 261–294.

Holt-Giménez, E., Shattuck, A., Altieri, M., Herren, H., & Gliessman, S. (2012). *We already grow enough food for 10 billion people and still can't end hunger*. Taylor & Francis.

Jacobs, K., & Sumner, D. A. (2002). The food balance sheets of the food and agriculture organisation: a review of potential ways to broaden the appropriate uses of the data. *Food and Agriculture Organisation, Rome*.

Jacquez, G. M. (2008). Spatial cluster analysis. *The Handbook of Geographic Information Science*, *395*(416).

Jones, A. D., Ngure, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition*, *4*(5), 481–505.

Kahsay, S., & Mulugeta, M. (2014). Determinants of rural household food insecurity in Laelay Maichew Woreda Tigray, Ethiopia. *African Journal of Agriculture and Food Security*, *2*(1), 106–112.

Kaiser, M. O. (1974). Kaiser-Meyer-Olkin measure for identity correlation matrix. *Journal of the Royal Statistical Society*, *52*, 296–298.

Kaplan, A. (2017). *The conduct of inquiry: Methodology for behavioural science*. Routledge.

Kennedy, G., Ballard, T., & Dop, M. C. (2011). *Guidelines for measuring household and individual dietary diversity*. Food and Agriculture Organisation of the United Nations.

Kim, S.-Y., Nayga Jr, R. M., & Capps Jr, O. (2000). The effect of food label use on nutrient intakes: an endogenous switching regression analysis. *Journal of Agricultural and Resource Economics*, *25*(1835-2016–149073), 215.

Kleibergen, F., & Schaffer, M. (2015). *RANKTEST: Stata module to test the rank of a matrix using the Kleibergen-Paap rk statistic*.

Kuwornu, K. J., Demi, S., & Ditchfield P.K. (2013). Analysis of food security status of farming households in the forest belt of the Central Region of Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, *13*(1).

Kuuire, V., Mkandawire, P., Arku, G., & Luginaah, I. (2013). 'Abandoning' farms in search of food: food remittance and household food security in Ghana. *African Geographical Review*, *32*(2), 125–139.

Leroy, J. L., Ruel, M., Frongillo, E. A., Harris, J., & Ballard, T. J. (2015). Measuring the food access dimension of food security: a critical review and mapping of indicators. *Food and Nutrition Bulletin*, *36*(2), 167–195.

Li, H., Calder, C. A., & Cressie, N. (2007). Beyond Moran's I: testing for spatial dependence based on the spatial autoregressive model. *Geographical Analysis*, *39*(4), 357–375.

Lin, J. Y., & Yang, D. T. (2000). Food availability, entitlements and the Chinese famine of 1959–61. *The Economic Journal*, *110*(460), 136–158.

Litchfield, J., & Waddington, H. (2003). Migration and poverty in Ghana: evidence from the Ghana Living Standards Survey. *International Workshop on Migration and Poverty in West Africa, University of Sussex, Brighton*, 13–14.

Lokshin, M., & Sajaia, Z. (2004). Maximum likelihood estimation of endogenous switching regression models. *The Stata Journal*, *4*(3), 282–289.

Lucas, R. E., & Stark, O. (1985). Motivations to Remit: Evidence from Botswana. *Journal of Political Economy*, *93*(5), 901–918.

Luginaah, I., Weis, T., Galaa, S., Nkrumah, M. K., Benzer-Kerr, R., & Bagah, D. (2009). Environment, migration and food security in the Upper West Region of Ghana. In *Environment and health in Sub-Saharan Africa: Managing an emerging crisis* (pp. 25–38). Springer.

Mabrouk, F., & Mekni, M. M. (2018). Remittances and food security in African Countries. *African Development Review*, *30*(3), 252–263.

Maddala, G. S. (1986). Disequilibrium, self-selection, and switching models. *Handbook of Econometrics*, *3*, 1633–1688.

Manepalli, U. R., Bham, G. H., & Kandada, S. (2011). Evaluation of hotspots identification using kernel density estimation (K) and Getis-Ord (Gi*) on I-630. *International Conference on Road Safety and Simulation*, 14–16.

Maxwell, D., Caldwell, R., & Langworthy, M. (2008). Measuring food insecurity: Can an indicator based on localised coping behaviours be used to compare across contexts? *Food Policy*, *33*(6), 533–540.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare. *Empirical Evidence from Tigray. In. Edited by Center FI. Somerville, MA: Tufts University*.

McGuire, S. (2015). *FAO, IFAD, and WFP. The state of food insecurity in the world 2015: meeting the 2015 international hunger targets: taking stock of uneven progress. Rome: FAO, 2015*. Oxford University Press.

McKay, A., & Deshingkar, P. (2014). Internal remittances and poverty: Further evidence from Africa and Asia (Migrating Out of Poverty, Working Paper 12). *Brighton: University of Sussex*.

Mendola, M. (2007). Agricultural technology adoption and poverty reduction: A propensity-score matching analysis for rural Bangladesh. *Food Policy*, *32*(3), 372–393.

International Organisation for Migration (2006). *World Migration 2005 Costs and Benefits of International Migration* (Vol. 3). Academic Foundation.

Ngema, P., Sibanda, M., & Musemwa, L. (2018). Household Food Security Status and Its Determinants in Maphumulo Local Municipality, South Africa. *Sustainability*, *10*(9), 3307.

Nigam, A. K. (2018). Global Hunger Index–Revisited. *Journal of the Indian Society of Agricultural Statistics*, *72*, 225–230.

Nkegbe, P. K., Abu, B. M., & Issahaku, H. (2017). Food security in the Savannah Accelerated Development Authority Zone of Ghana: an ordered probit with household hunger scale approach. *Agriculture & Food Security*, *6*(1), 35.

Oluwafemi, A., & Ayandibu, A. O. (2014). Impact of remittances on development in Nigeria: Challenges and prospects. *Journal of Sociology and Social Anthropology*, *5*(3), 311–318.

Pendleton, W., Crush, J., & Nickanor, N. (2014). Migrant Windhoek: Rural–urban migration and food security in Namibia. *Urban Forum*, *25*, 191–205. Springer.

Philips, T., & Taylor, D. (1990). Food security: An analysis of the SEARCA. *Guelph Survey*.

Quartey, P. (2006). *The impact of migrant remittances on household welfare in Ghana*.

Qudrat-I Elahi, K. (2006). Entitlement failure and deprivation: a critique of Sen's famine philosophy. *The Journal of Development Studies*, *42*(4), 541–558.

Rao, B. B., & Hassan, G. M. (2012). Are the direct and indirect growth effects of remittances significant? *The World Economy*, *35*(3), 351–372.

Ratha, D. (2016). *Migration and remittances Factbook 2016*. The World Bank.

Rea, A., & Rea, W. (2016). How Many Components should be Retained from a Multivariate Time Series PCA? *ArXiv Preprint ArXiv:1610.03588*.

Regmi, M., & Paudel, K. P. (2017). Food security in a remittance based economy. *Food Security*, *9*(4), 831–848.

Regmi, M., Paudel, K. P., & Williams, D. (2014). *Migration and remittance and their impacts on food security in Nepal*.

Rosenbaum, P. R., & Rubin, D. B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, *79*(387), 516–524.

Rubin, D. B. (2001). Using propensity scores to help design observational studies: application to the tobacco litigation. *Health Services and Outcomes Research Methodology*, *2*(3–4), 169–188.

Sassi, M. (2015). A Spatial, Non-parametric Analysis of the Determinants of Food Insecurity in Sub-Saharan Africa. *African Development Review*, *27*(2), 92–105.

Seaman, J. A., Sawdon, G. E., Acidri, J., & Petty, C. (2014). The Household Economy Approach. Managing the impact of climate change on poverty and food security in developing countries. *Climate Risk Management*, *4*, 59–68.

Sekhampu, T. J. (2017). Association of food security and household demographics in a South African township. *International Journal of Social Sciences and Humanity Studies*, *9*(2), 157–170.

Sen, A. (1981). Ingredients of famine analysis: availability and entitlements. *The Quarterly Journal of Economics*, *96*(3), 433–464.

Sen, A. (1982). *Poverty and famines: an essay on entitlement and deprivation*. Oxford university press.

Shadach, E., Rappaport, S., Dollberg, D., Tolmacz, R., & Levy, S. (2018). Relational entitlement, early recollections of parental care, and attachment orientation. *Current Psychology*, *37*(4), 781–791.

Smith, M. D., Kassa, W., & Winters, P. (2017). Assessing food insecurity in Latin America and the Caribbean using FAO's food insecurity experience scale. *Food Policy*, *71*, 48–61.

Stock, J. H., & Yogo, M. (2002). *Testing for weak instruments in linear IV regression*. National Bureau of Economic Research Cambridge, Mass., USA.

Swindale, A., & Bilinsky, P. (2006a). Development of a universally applicable household food insecurity measurement tool: process, current status, and outstanding issues. *The Journal of Nutrition*, *136*(5), 1449S–1452S.

Swindale, A., & Bilinsky, P. (2006b). Household dietary diversity score (HDDS) for measurement of household food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development*.

Tawodzera, G. (2012). Urban household survival and resilience to food insecurity in crisis conditions: The case of Epworth in Harare, Zimbabwe. *Journal of Hunger & Environmental Nutrition*, *7*(2–3), 293–320.

Tawodzera, G., & Crush, J. (2016). *The return of food: poverty and urban food security in Zimbabwe after the crisis*. Southern African Migration Programme.

Tawodzera, G., & Zanamwe, L. (2016). *The State of Food Insecurity in Harare, Zimbabwe*. Southern African Migration Programme.

Tolossa, D. (2002). *Household seasonal food insecurity in Oromiya Zone, Ethiopia: causes*. Organisation for Social Science Research in Eastern and Southern Africa.

Tsegai, D. (2005). *The Economics of migration in the Volta basin of Ghana: Household and district-level analysis*. Cuvillier Verlag.

UN (2015). The Millennium Development Goals Report 2015: United Nations New York.

Verbeek, M. (2008). *A guide to modern econometrics*. John Wiley & Sons.

Webb, P., Coates, J., Frongillo, E. A., Rogers, B. L., Swindale, A., & Bilinsky, P. (2006). Measuring household food insecurity: why it's so important and yet so difficult to do. *The Journal of Nutrition*, *136*(5), 1404S–1408S.

World Food Programme (2015). The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger targets. Rome: Food and Agriculture Organisation.

World Food Programme (2017). Integrated Context Analysis. Rome: Food and Agriculture Organisation.

WHO and UNICEF (2017). Report of the Fourth Meeting of the WHO-UNICEF Technical Expert Advisory group on nutrition Monitoring (TEAM). Geneva, Switzerland.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

Wooldridge, J. M. (2015). *Introductory Econometrics: A modern approach*. Nelson Education.

World Bank (2017). "Migration and Remittances: Recent Developments and Outlook. Special Topic: Return Migration." Migration and Development Brief 28. Washington, DC: World Bank.

World Bank (2018). "Migration and Remittances: Recent Developments and Outlook: Transit Migration." Migration and Development Brief 29. Washington, DC: World Bank.

Yang, D. (2011). Migrant remittances. *Journal of Economic Perspectives*, *25*(3), 129–52.

APPENDICES

APPENDIX A: Construction of food security measure

Household Food Insecurity Experience

During the last 12 months:	Domain of food insecurity
	LABEL
1 Was there a time when you or others in your household worried about not having enough food to eat because of a lack of money or other resources?	uncertainty and worry about food
2 Still thinking about the last 12 MONTHS, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	**MILD**
3 Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	
4 Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	insufficient food quantity (Malnutrition/ undernutrition)
5 Still thinking about the last 12 MONTHS, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	**MODERATE**
6 Was there a time when your household ran out of food because of a lack of money or other resources?	
7 Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	Starvation **SEVERE**
8 Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	

Source: Computed from GLSS 7

Food Groups used in the Computation of Food Consumption Score

Food group	Examples of food items	Food groups and Weight for FCS
Cereals and Grains	Guinea corn/sorghum, maize, millet, rice, other cereals	**Main Staples** (2)
Root and Tubers	Cassava, cocoyam, plantain, yam, other starchy staples,	
Meat	Corned beef, pork, beef, goat meat, mutton, bushmeat/wild game, other meat (dog, cat, etc.)	**Meat/Fish** (4)
Chicken	Chicken, other domestic poultry, game birds	
Eggs	Chicken eggs, other eggs	
Fish	Crustaceans, fish (fresh and frozen), fish (dried), fish (smoked), fish (fried), fish (canned), fish (salted), other fish	
Fruits	Coconut, banana, orange/tangerine, pineapple, mango, avocado pear, watermelon other fruits	**Fruits** (1)
Oils and fats	Coconut oil, groundnut oil, palm oil, shea butter, margarine/butter, other vegetable oil	**Oil** (0.5)
Legumes/nuts	Beans, cowpeas, peanuts, soy, pigeon pea and/or other nuts	**Pulses** (3)
Sugar	sugar, honey, jam, cakes, candy, cookies, pastries, cakes and other sweet (sugary drinks)	**Sugar** (0.5)
Milk and other dairy products	fresh milk/sour, yoghurt, cheese, other dairy products (Exclude margarine/butter or small amounts of milk for tea/coffee)	**Milk** (4)
Vegetables	Cocoyam leaves (kontomire), garden eggs, okra, carrots, pepper (fresh or dried), onions (large), tomatoes (fresh), other vegetables	**Vegetables** (1)

Source: Computed from GLSS 7

APPENDIX B: Principal Component Analysis

Variable	Component	Eigenvalue	Proportion	KMO
Question_1	0.3702	5.25967	0.6575	0.9419
Question_2	0.3704	.946879	0.1184	0.9320
Question_3	0.3780	.498478	0.0623	0.9233
Question_4	0.3821	.312217	0.0390	0.9397
Question_5	0.3877	.295219	0.0369	0.9328
Question_6	0.3673	.258255	0.0323	0.9378
Question_7	0.3364	.221857	0.0277	0.9094
Question_8	0.1963	.207426	0.0259	0.8862
KMO measure of sampling adequacy				0.9298

Source: Author's Construct 2019.

APPENDIX C: Summary Statistics

Descriptive Statistics

Continuous and Dummy Variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Food Insecurity Experience Scale	4,671	0.151	2.236391	-2.588951	3.309323
Food Consumption Score	4,671	119.538	66.55207	0	759.5
Received food	4671	0.347	0.476	0	1
Amount of food received	4,671	135.886	413.5976	1	8401
Amount of cash received	4,671	1074.235	3244.459	1	100001
Sex of Head	4,671	0.548	.4977379	0	1
Residence	4,671	0.43	.4951127	0	1
Age of head	4,671	49.381	17.76724	16	99
Household size	4,671	3.994	2.765218	1	25
Married	4,671	.0562	.496197	0	1
Employment status	4,671	0.731	.4433201	0	1
Credit access	4,671	0.106	.3081099	0	1
Head Schooled	4,671	0.707	.4552258	0	1
Dependency ratio	4,671	0.881	.9912901	0	10

Categorical Variables

Variable	Observation		Min	Max
Religion	4,671		0	4
No religion	200			
Christian	3,292			
Islam	778			
Traditionalist	393			
Others	8			
Ethnicity	4,671		0	8
Akan	2,011			
Ga-Adagme	244			
Ewe	724			
Guan	210			
Gurma	231			
Mole-Dagbani	927			
Grusi	206			
Mande	48			
other tribes	70			
Ecological zone	4,671		0	1
Coastal	1,284			
Forest	2,106			
Savannah	1,281			

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Source: Author's Construct, 2019.

APPENDIX D: Propensity Score Matching
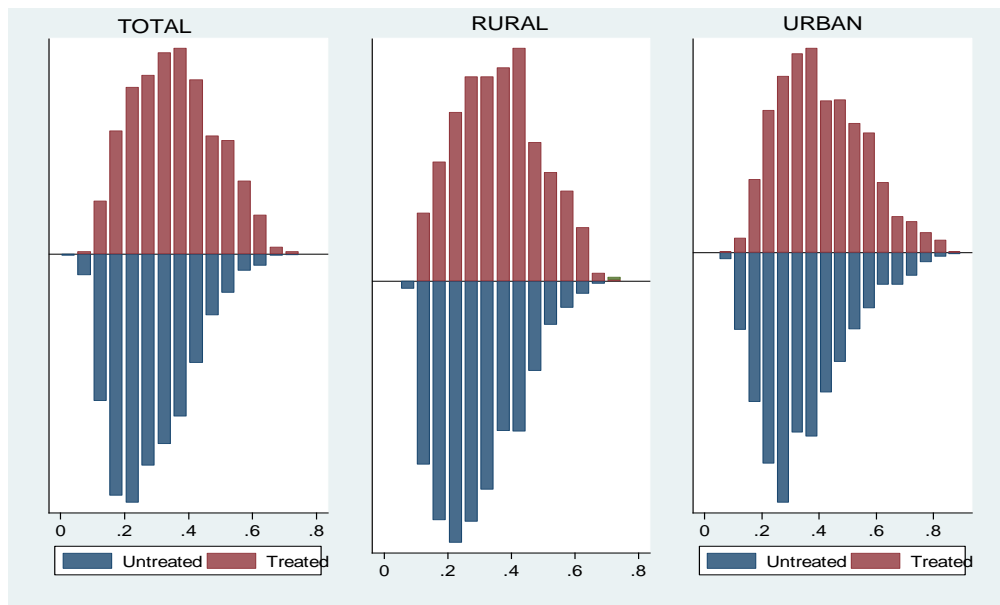
Propensity Score Distribution and Common Support

Source: Author's Construct 2019.

Balancing Information for the Propensity Scores

		Total	Rural	Urban
Mean Absolute Bias	Unmatched	22.5	23.8	16.2
	Matched	3.0	3.5	3.3
Pseudo R^2	Unmatched	0.060	0.059	0.055
	Matched	0.002	0.003	0.004
P-values	Unmatched	0.000	0.000	0.00
	Matched	0.609	0.838	0.891

Source: Author's Construct 2019.

APPENDIX E: Full Information Maximum Likelihood Estimates of the Endogenous Switching Regression Model

Food Insecurity Experience Scale

VARIABLES	TOTAL FIES_0	FIES_1	RURAL FIES_0	FIES_1	URBAN FIES_0	FIES_1
Male Headed Household	-0.0838	-0.194	-0.244*	0.00813	-0.0954	-0.253
	(0.0922)	(0.121)	(0.125)	(0.0535)	(0.131)	(0.194)
Household Heads' Age	-0.00131	-0.00252	-0.00187	-0.00173	0.000903	-0.00199
	(0.00241)	(0.00301)	(0.00300)	(0.00161)	(0.00390)	(0.00488)
Urban Residence	-0.717***	-0.559***				
	(0.0819)	(0.107)				
Married	-0.0824	-0.148	-0.142	-0.140**	-0.279**	-0.294
	(0.0925)	(0.123)	(0.127)	(0.0679)	(0.132)	(0.203)
Employed	-0.200**	-0.261**	-0.358***	-0.00332	-0.00151	-0.295*
	(0.0921)	(0.112)	(0.120)	(0.0420)	(0.136)	(0.179)
Religion of HH(ref:None)						
Christian	-0.442**	-0.954***	-0.378*	-0.286***	-0.824**	-0.826*
	(0.189)	(0.246)	(0.219)	(0.0903)	(0.334)	(0.429)
Islam	-0.652***	-0.870***	-0.527**	-0.266*	-1.136***	-0.678
	(0.214)	(0.282)	(0.250)	(0.145)	(0.380)	(0.494)
Traditionalist	-0.275	-0.548*	-0.405	-0.345**	-0.0818	-0.426
	(0.234)	(0.295)	(0.256)	(0.161)	(0.703)	(0.650)
Others	0.497		-0.629		1.149	

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	(0.748)		(1.006)		(1.072)	
Ethnicity of HH(ref:Akan)						
Ga-Adagme	-0.547***	-0.800***	-0.984***	-0.455***	-0.568**	-0.930***
	(0.176)	(0.223)	(0.271)	(0.0909)	(0.229)	(0.342)
Ewe	-0.107	-0.106	0.293*	0.471***	0.0382	0.223
	(0.116)	(0.141)	(0.161)	(0.0670)	(0.173)	(0.225)
Guan	0.675***	0.388*	0.762***	0.0620	0.747**	-0.108
	(0.194)	(0.236)	(0.244)	(0.109)	(0.323)	(0.430)
Gurma	0.708***	0.668**	0.593**	0.505***	-0.0249	-0.481
	(0.193)	(0.263)	(0.258)	(0.168)	(0.418)	(0.566)
Mole-Dagbani	0.846***	1.141***	0.422*	0.0603	0.276	-0.232
	(0.124)	(0.168)	(0.218)	(0.147)	(0.277)	(0.413)
Grusi	0.809***	1.560***	0.763***	0.0161	-0.481	-0.149
	(0.205)	(0.261)	(0.285)	(0.176)	(0.376)	(0.612)
Mandi	0.606	0.673	-0.0808	-0.582***	0.496	-1.797*
	(0.371)	(0.558)	(0.452)	(0.192)	(0.684)	(0.980)
Others	0.797**	-0.0836	1.582***	0.0332	0.165	-0.810
	(0.325)	(0.440)	(0.530)	(0.198)	(0.429)	(0.674)
Household head ever schooled	-0.926***	-0.725***	-0.626***	-0.173**	-0.896***	-0.709***
	(0.107)	(0.134)	(0.125)	(0.0684)	(0.180)	(0.230)
Dependency ratio	0.172***	0.209***	0.0871	0.0385	0.130*	0.168*
	(0.0409)	(0.0496)	(0.0533)	(0.0277)	(0.0707)	(0.0923)
Constant	0.691	2.953***	1.619***	5.166***	1.034*	2.072**
	(0.531)	(0.603)	(0.462)	(0.215)	(0.564)	(0.932)

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Rho	-0.580**	-0.473***	0-.097	-0.999***	0.067	-0.236
	(0.297)	(0.176)	(0.280)	(0.0001)	(0.271)	(0.305)
/rho	-0.662	-.5135987	-.0968385	-4.78835	.0671282	-.2405905
	(0.447)	.2271942	.2824508	.559941	.2720533	.3233369
Sigma	2.260016	2.174967	1.958283	3.779078	2.039319	2.105473
	.2599282	.1586527	.0444859	.1044465	.0442101	.1276739
/sigma	.8153721	.7770137	.6720679	1.32948	.7126159	.7445401
	.1150117	.0729449	.0227168	. 0276381	.0216788	.060639
LR test	0.0251			0.0000	0.8112	
Observations	4,671	4,671	2,663	2,663	2,008	2,008

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

Source: Author's Construct 2019.

Food Consumption Score

	TOTAL		RURAL		URBAN	
VARIABLES	FCS_0	FCS_1	FCS_0	FCS_1	FCS_0	FCS_1
Male Headed Household	-10.92***	-11.11***	-6.988**	-9.313***	-13.97***	-15.98***
	(1.968)	(2.593)	(2.902)	(3.202)	(3.293)	(4.323)
Household Heads' Age	0.202***	0.208***	0.0245	0.0365	0.0987	0.273**
	(0.0538)	(0.0658)	(0.0696)	(0.0823)	(0.102)	(0.109)
Urban Residence	3.820**	2.195				

	(1)	(2)	(3)	(4)	(5)	(6)
	(1.910)	(2.498)				
Married	20.10***	21.82***	13.46***	13.85***	14.26***	12.94***
	(1.984)	(2.643)	(2.952)	(3.432)	(3.309)	(4.452)
Employed	10.72***	19.86***	9.382***	16.91***	7.555**	18.73***
	(2.136)	(2.542)	(2.774)	(3.105)	(3.581)	(3.941)
Ethnicity of HH(ref:Akan)						
Ga-Adagme	24.96***	5.778	13.17**	5.048	27.97***	14.86**
	(3.844)	(5.213)	(6.273)	(6.897)	(5.527)	(7.519)
Ewe	0.322	-9.082***	-11.92***	-14.38***	0.303	-11.59**
	(2.791)	(3.327)	(3.742)	(4.339)	(4.700)	(5.083)
Guan	2.782	-1.148	-11.32**	2.081	15.88*	-7.450
	(4.512)	(5.447)	(5.652)	(6.349)	(8.187)	(9.560)
Gurma	0.0108	-15.79**	-15.08**	-9.610	-5.346	-19.18
	(4.864)	(6.284)	(5.980)	(7.098)	(11.52)	(12.53)
Mole-Dagbani	-11.46***	-23.41***	-17.48***	-11.93*	-2.301	-5.583
	(3.447)	(4.765)	(5.052)	(6.502)	(6.743)	(9.594)
Grusi	-22.77***	-34.84***	-24.05***	-15.69**	-17.74*	-33.12**
	(5.244)	(6.623)	(6.615)	(7.941)	(10.37)	(13.61)
Mandi	-4.499	13.16	-21.26**	27.71*	9.129	11.52
	(9.106)	(12.76)	(10.48)	(15.11)	(18.76)	(22.97)
Others	-3.487	-3.825	-30.09**	5.045	1.063	-13.43
	(7.408)	(10.33)	(12.28)	(13.03)	(10.91)	(16.05)
Religion of HH(ref:None)						
Christian	6.008	7.459	9.469*	12.68**	0.287	-7.961
	(4.315)	(5.614)	(5.067)	(6.398)	(8.423)	(10.18)
Islam	12.03**	3.872	14.53**	7.585	2.369	-16.55

	(4.986)	(6.392)	(5.802)	(7.480)	(9.799)	(11.24)
Traditionalist	10.80*	-3.469	9.198	8.978	21.84	-38.35**
	(5.513)	(6.641)	(5.923)	(7.244)	(18.85)	(14.92)
Others	4.114		-8.265		18.47	
	(17.56)		(23.31)		(28.42)	
Household head ever schooled	4.298*	6.768**	5.798**	10.61***	2.244	-2.059
	(2.483)	(3.139)	(2.903)	(3.585)	(4.829)	(5.496)
Dependency ratio	8.022***	7.194***	2.488**	1.161	4.251**	4.952**
	(0.832)	(1.085)	(1.235)	(1.409)	(1.714)	(2.117)
Constant	65.09***	8.190	93.37***	0.463	55.73***	-0.0130
	(7.115)	(9.802)	(8.864)	(10.62)	(12.57)	(14.95)
Rho	-0.974***	(0.962)***	0.084	0.951***	-0.978***	.962***
	(0.004)	(0.006)	(0.164)	(0.01)	(0.005)	(0.009)
/rho	-2.16***	1.973***	0.084	1.84***	-2.252***	1.973***
	(0.067)	(0.078)	(0.166)	(0.104)	(0.109)	(0.118)
Sigma	83.14813	90.40299	45.35154	78.41884	95.03235	91.79356
	1.319769	2.456002	.8489332	2.998339	2.243084	3.822522
/sigma	4.420624	4.504277	3.814444	4.362064	4.554217	4.519542
	.0158725	.0271673	.018719	.0382349	.0236034	. 0416426
Observations	4,671	4,671	2,663	2,663	2,008	2,008

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

Source: Author's Construct 2019.

APPENDIX F: Food Consumption Score for Relative Effect of Food and Cash on Food Security

VARIABLES	(1) Total_food FCS	(2) Urban_food FCS	(3) Rural_food FCS	(4) Total_cash FCS	(5) Urban_cash FCS	(6) Rural_cash FCS
Amount of Food received	-0.0340	0.0256	-0.0859**			
	(0.0277)	(0.0417)	(0.0377)			
Amount of Cash received				0.00386	0.0119**	-0.00448
				(0.00328)	(0.00591)	(0.00456)
Male Headed Household	-14.68***	-18.52***	-8.212***	-13.54***	-21.59***	-8.393***
	(2.140)	(3.584)	(2.817)	(2.091)	(4.759)	(2.588)
Urban Residence				5.487*		
				(2.911)		
Head_Age	0.120*	0.0746	0.0941	0.0817	0.0925	0.0145
	(0.0649)	(0.124)	(0.0776)	(0.0544)	(0.128)	(0.0586)
Household size	6.667***	9.766***	5.115***	6.823***	8.691***	5.455***
	(0.433)	(0.847)	(0.503)	(0.397)	(1.052)	(0.407)
Married	14.70***	15.90***	10.13***	15.25***	15.49***	13.99***
	(2.240)	(3.575)	(3.235)	(2.167)	(4.650)	(2.526)
Employed	9.495***	17.44***	5.818	14.43***	25.17***	11.72***
	(3.144)	(5.481)	(3.741)	(2.468)	(6.914)	(2.288)
Access to credit	8.051***	-3.534	18.30***	7.844***	-13.25	17.75***
	(2.845)	(5.610)	(3.422)	(3.001)	(8.383)	(2.940)
Religion of HH(ref:None)						

Christian	6.051	-5.652	16.30***	3.754	-16.90	13.48***
	(4.314)	(9.119)	(5.288)	(4.449)	(11.93)	(4.394)
Islam	10.26**	-6.707	19.04***	6.638	-16.45	15.70***
	(4.911)	(11.08)	(6.106)	(4.965)	(13.05)	(5.060)
Traditionalist	-1.235	-21.15	12.20**	-1.064	-26.90	10.83**
	(5.366)	(15.16)	(5.964)	(5.331)	(19.64)	(5.078)
Others	-7.140	3.771	-14.91	-1.631	9.341	-13.95
	(22.53)	(35.26)	(32.39)	(22.22)	(44.55)	(27.74)
Ethnicity of HH(ref:Akan)						
Ga-Adagme	26.59***	28.25***	27.33***	23.82***	35.03***	13.87***
	(4.715)	(6.238)	(8.738)	(4.011)	(8.685)	(5.176)
Ewe	-7.676***	-1.220	-15.69***	-6.391**	6.863	-19.02***
	(2.712)	(4.487)	(3.689)	(2.915)	(6.920)	(3.168)
Guan	4.816	15.77*	-5.881	7.575*	19.99*	-6.145
	(4.421)	(8.547)	(5.349)	(4.480)	(11.27)	(4.694)
Gurma	-12.61**	-5.012	-18.21***	-9.861*	4.494	-17.68***
	(5.061)	(11.03)	(6.042)	(5.071)	(15.13)	(5.262)
Mole-Dagbani	-10.51***	0.822	-21.40***	-8.091**	-0.499	-19.99***
	(4.041)	(7.469)	(5.260)	(4.006)	(9.688)	(4.628)
Grusi	-23.69***	-23.31**	-28.22***	-20.03***	-20.81	-27.84***
	(5.497)	(11.21)	(6.604)	(5.398)	(13.76)	(5.817)
Mandi	-8.046	-4.692	-17.41	-6.265	3.092	-15.53
	(9.810)	(20.39)	(11.49)	(9.708)	(25.87)	(9.808)
Others	-11.22	-7.620	-16.22	-9.553	-1.061	-23.21**
	(7.762)	(12.15)	(11.50)	(7.927)	(16.11)	(9.734)
Ecological zone Ref: coastal						

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Forest	-14.18***	-22.47***	1.035	-14.30***	-19.81***	-0.161
	(2.303)	(3.562)	(3.361)	(2.195)	(4.605)	(2.972)
Savanah	-57.40***	-55.88***	-45.25***	-54.22***	-46.95***	-45.17***
	(3.969)	(6.892)	(5.364)	(4.036)	(9.945)	(4.616)
Household head ever schooled	8.269***	7.299	6.542**	5.948**	-1.048	8.030***
	(2.429)	(4.740)	(2.921)	(2.690)	(7.122)	(2.722)
Dependency ratio	2.410**	2.334	3.096**	2.078**	2.970	1.783*
	(1.082)	(1.940)	(1.365)	(0.976)	(2.343)	(1.040)
Constant	95.25***	92.03***	91.23***	83.28***	89.51***	84.54***
	(7.750)	(16.39)	(8.640)	(6.551)	(16.28)	(6.946)
Observations	4,500	1,949	2,551	4,495	1,948	2,547
R-squared	0.226	0.214	0.082	0.246	-0.325	0.328

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

Source: Author's Construct 2019.

APPENDIX G: Distribution of Households across Districts

District Name	No. of Households	District Name	No. of Households	District Name	No. of Households	District Name	No. of Households
Jomoro	85	Kpone Katamanso	26	Atwima Mponua	45	Banda	14
Ellembelle	52	Ningo Prampram	29	Amansie West	45	Sene East	29
Nzema East	39	Ada East	13	Amansie Central	45	Bole	38
Ahanta West	59	South Tongu	74	Adansi south	42	Sawla-Tuna-Kalba	70
Sekondi- Trakoradi	279	Keta Municipal	90	Obuasi Municipal	88	West Gonja	45
Shama	60	Ketu South	120	Adansi North	28	Gonja Central	59
Wassa East	40	Ketu North	70	Bekwai Municipal	45	East Gonja	85
Tarkwa Nsuem Municipal	55	Akatsi South	68	Bosome Freho	15	Kpandai	70
Prestea/Huni Vally	111	Central Tongu	27	Asante Akim South	46	Nanumba South	44
Wassa Amenfi East	44	Agotime Ziope	13	Asante Akim Central M	29	Nanumba North	90
Wassa Amenfi West	44	Ho Municipl	147	Ejisu Juaben Municipa	58	Zabzugu	15
Aowin	68	South Dayi	27	Bosumtwi	44	Yendi Municipal	69
Sefwi Akontombra	42	Kpandu Municipal	45	Atwima Kwanwoma	30	Tamale Metropolis	131

Sefwi Wiaso	88	Hohoe Municipal	118	Kumasi Metropolis	630	Tolon	43
Sefwi Bibiani-Ahiwaso	81	Biakoye	45	Atwima Nwabiagya	43	Savelugu Nanton	60
Juabeso	28	Jasikan	41	Ahafo Ano South	43	Karaga	44
Bia West	56	Kadjebi	55	Ahafo Ano North	30	Gushiegu	56
Wassa Amenfi Central	43	Krachi East	53	Offinso Municipal	30	Saboba	30
Suaman	15	Krachi West	8	Afigya Kwabre	56	Chereponi	30
Bodi	29	Nkwanta South	51	Kwabre East	30	Bunkpurugu Yonyo	73
Bia East	13	Nkwanta North	45	Afigya Sekyere Mampong	30	Mamprusi East	73
Komenda-Edina-Egyafo-Cape Coast Metropolis	102	North Tongu	43	Municipal	30	Mamprusi West	59
	102	Akatsi North	15	Sekyere East	30	North Gonja	15
Abura-Asebu-Kwamankes	87	Adaklu	29	Sekyere Afram Plains	15	Kumbumgu	15
Mfantsiman	72	Ho West	71	Sekyere Central	45	Sagnerigu Municipal	98
Ajumako-Enyan-Essiam	85	Afadzato South	60	Offinso North	29	Mion	40
Gomoa West	86	North Dayi	27	Asokore Mampong Munic	104	Tatale	43
Effutu Municipal	41	Krachi Nchumuru	25	Asante Akim North	15	Mamprugu Moagduri	14

District	No.	District	No.	District	No.	District	No.
Gomoa East	138	Birim South	65	Sekyere Afram Plains	15	Builsa North	68
Ewutu Senya	56	Birim Municipal	69	Asunafo South	51	Kasena-Nankani West	98
Agona East	44	West Akim Municipal	61	Asunafo North Municip	72	Kasena Nankana East	149
Agona West Municipal	88	Suhum Municipal	44			Bolgatanga Municipal	184
Asikuma-Odoben-Brakwa	73	Nsawem Adoagyiri Muni	50	Dormaa Municipal	71	Talensi	111
Assin South	61	Akwapem North	66	Dormaa Central Munici	29	Bongo	116
Assin North Municipal	64	New Juaben Municipal	115	Tano South	34	Bawku West	131
Twifo Ati Morkwa	40	Yilo Krobo	45	Tano North	55	Garu Tempane	148
Upper Denkyira East M	27	Lower Manya	60	Sunyani Municipal	73	Bawku Municipal	118
Upper Denkyira West	44	Asuogyaman	56	Sunyani West	59	Builsa South	58
Twifo-Heman-Lower Den	28	Upper Manya	30	Berekum Municipal	75	Nabdam	42
Ekumfi	41	Fanteakwa	60	Jaman South	59	Binduri	73
Ewutu Senya East Muni	39	East Akim Municipal	74	Jaman North	40	Pusiga	75
Ga South Municipal	142	Kwaebibirem	68	Tain	41	wa West	133

District	No.	District	No.	District	No.	District	No.
Ga West Municipal	68	Akyem Mansa	41	Wenchi Municipal	54	Wa Municipal	187
Ga East Municipal	40	Birim North	60	Techiman Municipl	79	Wa East	135
Accra Metropolis	604	Atiwa	44	Nkoranza South	60	Sissala East	110
Adenta Municipal	34	Kwahu West Municipal	58	Nkoranza North	40	Nadowli-Kaleo	150
Ledzekuku/Krowor Muni	86	Kwahu South	41	Atebubu Amantin	43	Jirapa	161
Ashaiman Municipal	54	Kwahu East	42	Sene West	30	Sissala West	98
Tema Metropolis	114	Kwahu Afram Plains No	42	Pru	72	Lambussie Karni	101
Shai Osudoku	30	Upper West Akyem	41	Kintampo South	44	Lawra	117
Ada East	14	Akwapim South	15	Kintampo North Munici	53	Daffiama Bussie	70
Ga Central Municipal	36	Ayensuano	55	Asutifi South	40	Nandom	105
La Dade Kotopon Munic	55	Debkyembour	33	Dormaa West	15		
La Nkwantanang Madina	53	Kwahu Afram Plains South	60	Techiman North	44		
Total							**14009**

Source: Computed from GLSS 7

APPENDIX H: Post Estimation Tests

Multicollinearity, Omitted Variable and Model Specification Test

Test	Link test		RESET	VIF
Output	_hat	_hatsq		
		p-value	p-value	VIF
FIES_FOOD	0.000	0.269	0.2099	1.88
FIES_CASH	0.000	0.001	0.000	1.88
FIES_TOTAL	0.000	0.001	0.000	1.85

Source: Author's Construct 2019.

Test for Instrumental Variables

Test Output		Under-identification	Weak identification	Over-identification
TOTAL_FOOD	statistics	26.657	19.93	2.337
	p-value	0.000		0.126
RURAL_FOOD	statistics	20.659	19.93	3.775
	p-value	0.000		0.05
URBAN_FOOD	statistics	10.414	19.93	0.743
	p-value	0.005		0.3886
TOTAL_CASH	statistics	29.090	19.93	0.506
	p-value	0.000		0.4771
RURAL_CASH	statistics	48.790	19.93	1.247
	p-value	0.000		0.2641
URBAN_CASH	statistics	9.932	19.93	0.066
	p-value	0.007		0.797
TOTAL	statistics	14.738	11.04	3.561
	p-value	0.002		0.1685
RURAL	statistics	8.156	11.04	1.358
	p-value	0.042		0.5071
URBAN	statistics	7.53	11.04	0.427
	p-value	0.05		0.8078

Source: Author's Construct 2019.