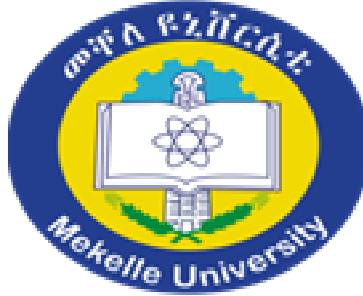


MEKELLE UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS AND SOCIAL STUDIES



Impact of Food and Cash Remittances on Household Food Insecurity Response in Tigray Region

(In case of the Central Statistical Agency Data, 2018/2019)

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A Thesis Submitted to Mekelle University, College of Business and Economics in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Economics /specialization in Financial Economics

Mekelle, Ethiopia

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Dedication

This thesis is dedicated to my dear mom and my lovely Wife,
as well as all my loyal spiritual friends.

Declaration

I am here to declare that the thesis work entitled “*Impact of Food and Cash Remittances on Household Food Insecurity Response in Tigray Region*”(In case of the Central Statistical Agency Data,)is submitted to partial fulfillment of the requirements for the award of the degree of Master of Science in Economics to the College of Business and Economics of Mekelle University. The original work carried out by myself is presented to the department of economics. And the matter embodied in this thesis work has not been submitted earlier for award of any degree and I believe that this is the original work on this title to the best of my knowledge.

Name of the student: Afewerky Tadesse

Signature _____

Letter of Certification

This is to certify that this thesis entitled “*Impact of Food and Cash Remittances on Household Food Insecurity Response in Tigray Region*” (In case of the Central Statistical Agency Data, 2018) is an authentic work of Mr. Afewerky Tadesse Kifle, ID No CBE/Rpe01/12 who carried out the research under my guidance. I certify further to the best of my knowledge that the work reported here does not form part of any project or thesis on the basis of which a degree or award was conferred on an earlier occasion on this or any candidates.

Signed by Examining Committee:

Advisor----- signature-----date-----

Internal examiner----- signature-----date-----

External examiner ----- signature-----date-----

Chair of Department of Graduate program coordinator-----

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Abstract

Household food insecurity remains a critical development challenge particularly in low and middle income countries where livelihoods are vulnerable to economic and environmental shocks. The study examines the impact of food and cash remittances on household food insecurity, outcomes exploring whether transfers and improve dietary adequacy in the targeted Tigray region applying qualitative and quantitative descriptions, the T-test and Robustness check methods. Food insecurity can be identified in various suspects and is a pervasive global issue impacting individuals which can be characterized by limited nutritious food in the household. Using household level survey data and applying econometric characteristics the analysis assess how different forms of remittances influence food access, consumption patterns and coping strategies. The paper used secondary data from the central statistics agency (Ethiopia Socio economic Survey) and analyzed to identify food insecurity around the zones and woredas of the region. The findings indicate that both food and cash remittances significantly contribute to reducing household food insecurity, though their effects vary in magnitude and mechanism. Therefore, the findings highlight a significant disparity and show ways of minimizing the food insecurity across the region. It also highlights the importance of migration linked support system and suggests that policies facilitating safe migration and efficient remittances channels can enhance household resilience In line to this, I insights contribute to a deeper understanding of how remittance flows serve as informal social protection in food insecure settings.

Key words: *food insecure, migration, low and middle income, dietary, adequate food,*

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Abbreviations and Acronyms

AgSS	Annual Agricultural Sample Survey
WFS	World Food Summit
CSA	Central Statistical Agency
HHDFS	Household Food Security
MFS	Measurement of Food Security
FAD	Food and Availability Decline
FCS	Food consumption Score
FS	Food Security
EA	Enumeration Area
HHD	Household
IFAD	International Fund for Agricultural Development
GFSI	Global Food Security Index
ESPS	Ethiopia Socio-Economic Panel Survey
EAs	Enumeration Areas
FIES	Food Insecurity Experience Scale
USDA	United States Department of Agriculture
UNFAO	United Nations Food and Agriculture Organization
FCE	Food Consumption Expenditure
DDS	Dietary Diversity Score
FFs	Food Frequency score

Chapter One

1. Introduction

Remittances flow becomes a vital source of foreign exchange for many developing countries. As a result the issue of whether they act as complements or substitutes for domestic investment avenue of research. Although remittances are not necessarily connected to migration, in practice most remittances are accounted for by funds sent by migrants to their relatives, friends and others in their countries of origin. Migration whether national or international (can have reasons like conflict, repressive governance and limited economic opportunities), has become an important livelihood strategy among households in most developing countries. This is because it provides migrant households with remittances that are uncorrelated with agricultural income (World Bank, 2006). Remittances sent back home by these migrants is believed to have a huge impact on the socioeconomic conditions of families left behind in the country of origin. It is clear that the volume of remittances to developing countries can increase their economic access and development. As the number of migrants raises remittance also increase in importance at both individual and national level. And legal migrants will be more likely to remit and may have higher remittances than illegal immigrants for several reasons such as their job opportunity, income level and financial access (World Bank, April/2021).

Assessing the effects of both cash and food remittances on households provides a nuanced understanding of their contributions to poverty alleviation, food security and socio-economic development in migrant sending communities. This understanding informs targeted interventions and policies aimed at harnessing the full potential of remittances to improve livelihoods and wellbeing.

Moreover, there are evidences that remittance flows are underreported, so that the actual amount could more than double the official formal transfer. In richer households, they may provide capital for small business and entrepreneurial activities. The most recorded remittances in SSA are only a small fraction of total remittances. Several motives have been advanced to explain international remittances repatriated earnings of immigrant workers. Two motives have been identified for sending remittances; the insurance and investment motives.

It is clear that insurance is a protection for financial lose and or it is a form of risk management during loss, damage and injury. In short, insurance is risk management primarily used to hedge against the risk of a contingent loss. A person's need for status might also be a motive for people to purchase

insurance, but more on a material field. Status the western society is usually measured by the amount of goods we consume and people might deem it important to remain in a high status position (Frank, 1985). People might buy extra insurance for the goods they have bought so as when something happens they are not faced with a decline in status, but can replace the goods accordingly.

On other hand, the commitment of current financial resources in order to achieve higher gains in the future is investment. It is an asset acquired with aim of generating more income and is an asset or item accused with the goal of generating income as well as characterized by safety, income and capital growth. Generally, it is concerned with risk taking activity for future returns over a long period which is not necessary to be marketable in the short run i.e. easy to change in to cash in short (Investopedia, marketable Sources).

Remittances include cash and noncash items that flow through normal channels, such as through electronic mechanism, or through informal channels, like money or goods carried across borders. They are the private savings of workers and families that are spent in the home country for food, clothing and other expenditures, and which drive the home economy (Investopedia website). The remittances sent by migrants can be used as a means of insurance and asset producing financial instruments through which Diasporas can invest in their country of origin to aid their families and friends. On the other side food is one of the basic necessities of life that can remit by migrants. It targets to help their families in order to contain nutrients, substances essential for the growth, repair and maintenance of body tissues as well as for the regulation of vital processes. But the greatest portion of the developing countries is food in secured.

Remittances contribute hugely to the economic health and social development of developing countries. There is also difference in the developing nations in terms of number of migrants and need to help their families. Most families living in slow growing economies and developing nations like Ethiopia relay heavily on the remittances as their main source of income. The World Bank ranks Ethiopia to be the 8th largest remittance receiver in sub-Saharan Africa in 2010, with an inflow of remittances reaching US\$ 387 million , to be compared with net Foreign Direct Investment inflows of US \$100 million and net Overseas Development Assistance (ODI) at US\$ 3.3 billion (World Bank, 2011). Despite its large migrant population, Ethiopia has not fully tapped its potential and data on remittance flows is highly problematic (Geda et al., 2011). Not surprisingly, the potential impact of those flows on economic development has also generated considerable interest, both among academics and policy makers.

Although remittances are increasingly important to many economies, accurate measurement of it remains difficult. These difficulties can be simplified by understanding the amount of sent and received, estimates based on reported payments tend to be considerably smaller than estimates based on the reported receipts.

Cash remittances refer to monetary transfers sent by migrants to their families or communities in their home countries. These transfers are typically in the form of cash or electronic payments and cash is used by recipients for various purposes, including the household expenses, education, health care and investments (IMF, 2017)

Food remittances on the other hand, involve the direct provision of food items by migrants to their families or communities. Instead of sending money, migrants may choose to send food staples such as rice, canned goods, soap, 'Berbere', or other non-perishable items to support their loved ones nutritional needs. Both cash and food remittances serve as crucial forms of support for households in recipient countries, but they differ in their mechanisms and implications. Cash remittances offer flexibility, allowing recipients to allocate funds according to their priorities and needs. Food remittances, while providing direct nutritional support, may lack flexibility and may not address other household expenses. However, they can still play a significant role in alleviating food insecurity and supplementing local diets, especially in communities where access to nutritious food is limited (Mark Nord et al, 2014).

Moreover, the impact of food and cash remittances extends beyond immediate food security. Remittances can foster economic and social development: when households receive remittances; they can invest in productive activities such as agriculture, livestock or small business. These investments can enhance household income, economic resilience and ultimately contribute to long term food security. It is worth noting that the impact of food and cash remittances on household food insecurity can vary depending on the specific context. Factors such as the amount of remittances, frequency and reliability of remittances transfer as well as local food availability and prices can influence the effectiveness of remittances in improving food security (Mark Nord et al, 2014).

1.1. Statement of the Problem

Food insecurity contributes to be persistent challenges for many households particularly in Tigrai region. At the same time, migration has become a common livelihood strategy and many households depend on food and cash remittances sent by migrant family members to supplement their income and meet basic needs. Hence, food insecurity can manifest in various ways including uncertainty about where the next meal will come from, reduced food intake or skipping meals and reliance's on low-quality or less nutritious foods (Maria T. Johnson. 2015).

Although remittances are widely believed to play a role in improving household welfare, the extent to which food and cash remittances specifically reduce household food insecurity remains insufficiently understood. The connection 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.

Existing studies tend to focus mainly on cash remittances and their influence on poverty reduction, often overlooking the role of in-kind remittances (such as food, parcels, clothes..) that may directly affect household food availability. Moreover, the relative effectiveness of food versus cash remittances in improving food access, dietary diversity and resilience during economic shocks is not clear. .

The production of Tigrai is mostly dependent on a single annual crop season. Due to this factor, remittance is one mechanism households used to deal with in the food insufficiency of the household of both urban & rural areas. Specially, during the war of Ethiopian government, non-state militants and the Eritrean soldiers; Tigrai was in a very hard siege. This causes the region left without food, health centers, education and stability in general.

Therefore, the problem this study seeks to address in the limited empirical evidence on how both food cash remittances influence household food insecurity and where these forms of support provide meaningful, sustainable improvement in food access and consumption patterns. These knowledge gap hinder the development of targeted policies through improved remittance systems and migration related support networks in Tigrai.

1.2 Research Questions

This thesis tried to address the well-organized research questions such as:

- Can the food and cash remittances really contribute positively to the economic status as a whole?
- Whether the people get any assistance from government or others?
- How the food and cash assistances can affect the household food security?

1.3 Objectives of the study

This study has its own general and specific objectives.

1.3.1. General Objectives

- To assess the impact of food and cash remittances on household food insecurity

1.3.2 Specific Objects

- To compare the effectiveness of food versus cash remittances in improving food security outcomes.
- To identify the socioeconomic factors that influences the effectiveness of food and cash remittances on food security.
- To assess the impact of cash remittances on household food insecurity

1.4 Significance of the study

Generally, remittances or the supports and gifts donated by family members and other relatives have several economic impacts in poverty reduction, stabilizing household income, increasing consumption in the households besides to investing in human capital and increasing the foreign exchange.

The study seeks to fill the current knowledge gaps by incorporating food remittance to the policy dialogue in addition to significant in light of incorporating the effect of food remittance in food security discourse in Tigrai. Likewise, transforming food security outcomes into geographical information would guide decision making to pinpoint vulnerable areas to food insecurity and direct appropriate intervention. Thus, this 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 households. One of the fundamental points of food security requires comprehensive efforts to ensure people's right to adequate and sustainable food.

Hence, directly or indirectly the family (household) is beneficiary in owning the remit and control expenses of health care, school fee, starts to invest as a result own small business.

And the economy (as a macro level) of the country could be advanced over the policy makers awareness to the society based on the use of remittances wisely.

The developmental agencies can be advanced in getting the data about and save their waste of time and wealth.

1.5 Scope of the study

The scope of this study is meticulously **delimited** along three critical dimensions to ensure focus and depth in the analysis of the causal impact of remittances on food security:

1.5.1 Geographic and Data Scope

The study's analysis is strictly limited to **rural households within the TigrAI National Regional State of Ethiopia**. It utilizes cross-sectional data from the 2018 Central Statistical Agency (CSA) survey (specifically, the ESPS-Wave 4 dataset). This delimitation ensures that the findings and policy implications are geographically specific and temporally bound to the conditions reflected in the chosen dataset.

1.5.2 Thematic and Outcome Scope

The research focuses exclusively on the impact of **two specific financial flows: food remittances and cash remittances**. The outcome variable is centered on three key, established indicators of household food security: the **Coping Strategy Index (CSI)**, the **Household Dietary Diversity Score (DDS)**, and **Food Consumption Expenditure (FCE)**. Other potential impacts of remittances (e.g., on investment, asset accumulation, or non-food consumption) are outside the scope of this thesis.

1.5.3 Methodological Scope

The econometric analysis is confined to applying **Descriptive Statistics** and the **Instrumental Variable (IV) Two-Stage Least Squares (2SLS) regression model**. This focus is specifically designed to address the methodological challenge of endogeneity between remittance receipt and food security, thus ensuring a rigorous estimation of the causal effect. Alternative estimation strategies or other advanced econometric techniques are not within the scope of this particular study.

1.6 Limitations of the study

Although the study seeks to provide valuable insights based on the impact of food and cash remittances on household food insecurity, it is limited in several factors. Some of them are; unavailability of current and cross sectional nature of the data, variations in remittance channels, unavailability distinguished data of food and cash and since it is secondary data unable to manipulate easily.

1.7 Organization of the Paper

This final thesis deals with the effect of food and cash remittances on household food security concerning the Tigray region. The details of this paper are sub divided in to five chapters. The first chapter deals with introductory part outlines under which statement of the topic, background of the study, objectives and scope of study. The second chapter also consists of the review of literature i.e. the conceptual and theoretical aspects of the study. The third chapter consists of the methodology and data analyzing in addition to the sample size as well as the data gathering techniques. And then, the fourth chapter is out lined to explain the findings (result analyzing) of the thesis. Finally, the recommendations and conclusions are explained under the fifth chapter. At last but not list, the appendixes and other bibliographies are part of this paper that helped to accomplish the final thesis are mentioned step by step last.

Chapter Two

Literature Review

1. Introduction

This chapter mainly consists of related books and some thoughts of scholars that helps to describe and analysis the point of my research. It also deals about conceptual and theoretical aspect of the topic as well as the four pillars of food security, food availability decline and overview of migration in Ethiopia in relation to remittances.

1.1 Basic concepts and definition of food (in) security

In the former times, different researchers defined food security differently for their own purposes. It is not because of its broadness and new point of view but also it is due to the absence of common concept about the specific term to every writer. Therefore, many definitions have been developed by different authors at different times about food insecurity.

Food security was introduced for the first time in the literature following the world food conference held in 1974 due to the food crises and major famines (USDA 1980). The concept encompasses not only the lack of food but also the uncertainty about the availability of food and the ability to obtain it consistently. Food security was defined as the availability of adequate food at the global and national level by the UNFAO (1970). The United Nations Food and Agriculture Organization's (FAO, 1996) defined food security as when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The World Bank (1996) defined food security as, year round access to the amount and variety of food required by all household members in order to lead active and healthy lives, without undue risk of losing such access. The International Federation of Red Cross and Red Crescent Societies (IFRCRCS, 2006) also defined food security in a generalized form just based on the three important pillars: food availability, food access and food utilization.

This macro level definition of food security only refers to the supply sides of food security by disregarding the demand side of food security. That means, it disregards the other important dimensions of food security like food access, utilization and stability and it considers only food available at the national and global level. But, food availability at global and national may not necessarily imply food security at the household level. This definition of food security led to the development of the food availability decline theory of food security and different researchers tried to

examine the determinants of food availability at the global and national level. However, the food access dimension of food security has got wider attention since 1980 and the unit of analysis of food security also has shifted from global and national level to household level of food security. This shift in paradigm from the supply side to the demand side of food security came up with the new concept and definition of food security. Food security was defined as access by all people at all times to enough food for active and healthy life. According to this definition, food security refers to a situation in which individuals have physical and economic access to the food they need.

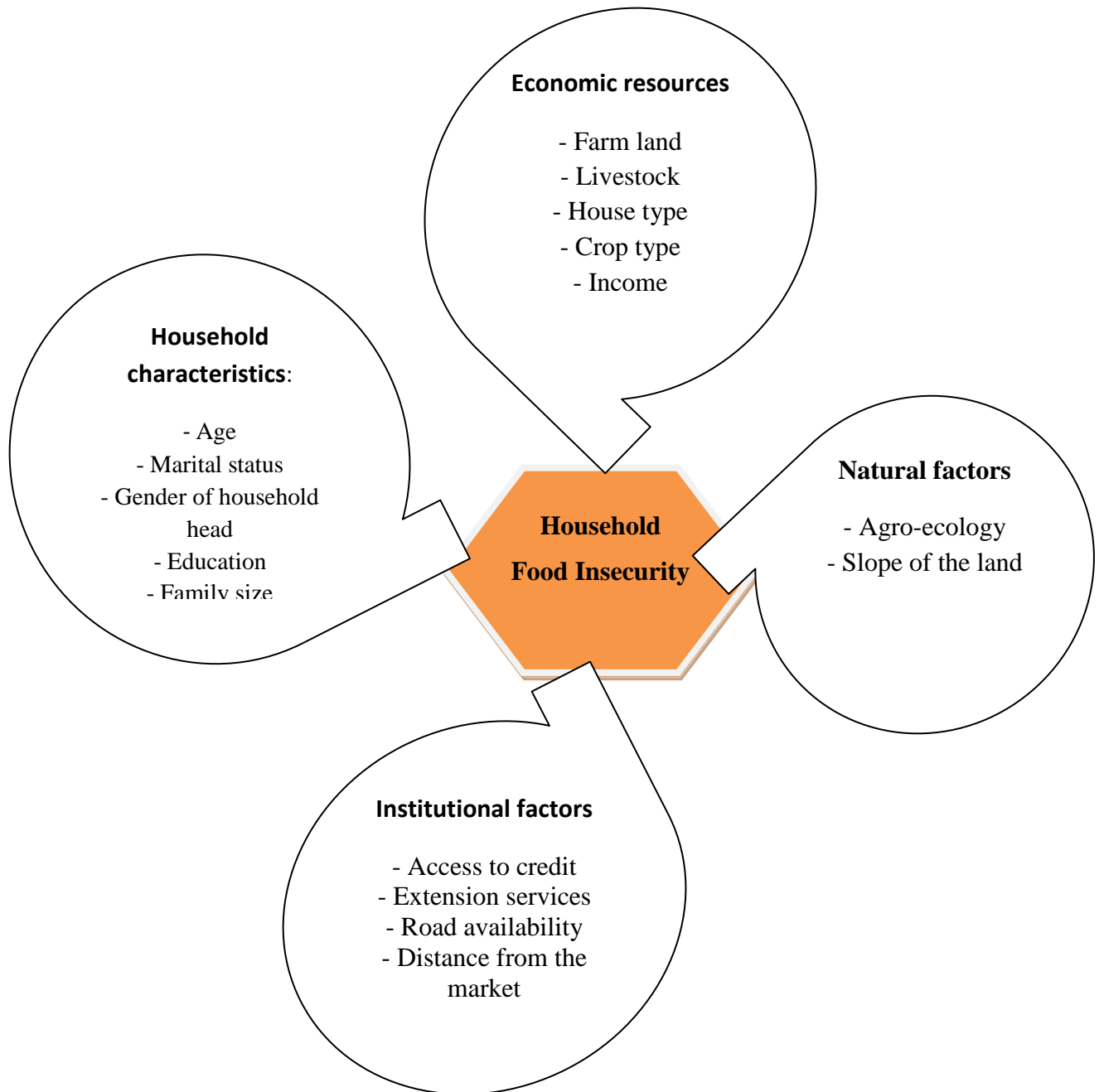
A household is considered to be food insecure if its consumption falls below the minimum daily recommended caloric intake for an individual to be active and healthy. Still, this definition of food security does not include one dimension of food security, food utilization. This definition of food security also led to the development of the food entitlement decline theory of food security which states that food security depends on the household's entitlement to food. There are four sources of household's food entitlement and these are own production, own labor, trade and transfer. Finally, a definition of food security which contains both the demand and supply sides and all the four dimensions of food security were given by FAO (1996). Accordingly, food security was defined as the situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for active and healthy life (FAO, 1996). This shows that food security is a broader concept and it is more than food production and food access. It consists of four pillar dimensions namely; food availability, food accessibility, food utilization and stability of food supply.

Food availability refers to the physical presence of food at household level whether from own production or through markets. Food access refers to the ability of the household to obtain appropriate diet and is in particular linked to resources at the household level. Food utilization, which is related to the biological concept, refers to the individual level of food security and it is the ability of the human body to convert food into energy. Stability of food supply refers to the current and future food status at a different point in time. The term all times refers to the stability dimension in the food security definition.

Remittances have received substantial consideration over the past decade due to the assessed impact on development. Because, it very important in improving the standard, facilitate almost all family members to own a sustain living and aids to eliminate poverty. 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. Nowadays, food

insecurity is one of the development challenges of developing countries in general and African countries in particular. According to FAO (Food and Agricultural Organization 2010), about one billion people are estimated to be undernourished where 98% of these people are living in developing countries. Sub Saharan Africa has the highest prevalence of under-nourishment among developing regions (FAO 2010).

Figure 1 .Household chain of foods Insecurity



1.2 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 conceptualization of food security; theoretical issues in the measurement of food security; Entitlement Theory. Theoretical Issues in the Conceptualization of Food Security A decade and a half have witnessed the rise of food security as a policy tool intended to achieve the SDGs (Food and Agricultural Organization 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) conceptualized 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 utilization 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

This refers to physical presence of food within a region or country. It includes production, distribution and stocking to insure enough food is produced & accessible to meet the population needs. The availability pillar hinges on adequate amounts of food from 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 the phsio-economic infrastructure (FAO, IFAD & WFP 2015).

The world, according to FAO, International Fund for Agricultural Development (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.

Access

Accessibility focuses on whether individuals or communities have the economic means to obtain food. This involves affordability as well as physical and social access to food markets, distribution channels & source of food. 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 focuses 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 socio-cultural, economic and political reasons; which Sen (1981) explained to be the consequences of poverty.

Utilization

This address the quality and safety of food as well as the ability of individuals to effectively use it to meet their nutritional needs. This pillar encompasses dietary diversity, food safety, hygiene and health care access to prevent malnutrition and ensure proper utilization of available food resources. 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 utilization dimension. Utilization 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 utilization 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. Utilization has further been explained to include issues of feeding practices, food preparation, which Sassi (2015) argued to enhance sufficient nutrient intake by individuals.

Stability

Finally, the FAO considered stability as the fourth domain of food security, in recognition that shocks in the other three pillar need to be 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.

1.3 Issues on the Measurement of food security

Measurement, according to Kaplan (2017) is essential in the process of inquiry and allows standardization 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, utilization 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. And provide estimating of proportions of the population challenges food insecurity via the food insecurity experience scale (FIES).

The intricacy and contextualization 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 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 utilization, to analyses food shortages and surpluses. FAO with other organizations 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).

1.4 Food Availability Decline/ FAD

The food availability decline could imply minimizing the quantity and quality in accessibility of food due to varies reasons like climate change, economic factor, conflict and instability, overpopulation and low agricultural practices. The consequences of food availability decline can lead to malnutrition (health issues), high food insecurity and other related problems (Wikipedia). The food availability decline (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 centered 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.

This section reviews the literature on food security, taking into cognizance their methods, determinants, and other related themes. In undertaking the reviews within the scope of the main issues, the study synthesizes global empirical studies with evidence from developing countries. 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) analyzed 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 town. The study revealed such factors as education, means of transport, farm mechanized equipment, agricultural yield, ownership of livestock, food consumption expenditure, prompting variation in food security status.

The discriminate 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. It is clear that some researches supported this stance and argued that agricultural productivity is a key to food security in Tigray due to lack of knowledge and instability on the region. These challenges are still highly obstacles to the nearby society. The results of these challenges face the family members still with imbalance to their income of the household. Thus, larger households size contributes to household food insecurity compared to smaller household sizes and hence these studies advocated for intervention not to address the family size but also the role of it to secure on food.

1.5 Conceptual implication of Remittances

The impact of food and cash remittances on household food insecurity can be understood through a conceptual framework that considers the interplay of various factors. At its core, this concept revolves around the transfer of resources in the form of either food provisions or monetary remittances from migrants to their families in their home countries. The resources aim to alleviate household food insecurity by improving access to food, enhancing dietary diversity, promoting economic development and increasing resilience to shocks. The concept recognizes that food and cash remittances can act as a critical support mechanism for vulnerable households facing challenges in meeting their food needs (Maria T. Johnson. 2015).

Remittance is very vital in contribution of development in the macro and micro levels. They are the funds transferred from migrants to their home country. Regarding the word formation, the word is derived from the word "remit" meaning "to send back". Thus, it refers to the act of transferring or sending certain amount of money by one part to the other. Most of the time people consider the transfer of funds overseas as a remittance but the transfer within the country also remains the same (SupriyaHamal blog). Therefore, remittances can be divided into two; first, the inward remittances which indicate the transfer of funds from one account to another either domestically or internationally. Secondly, outward remittances imply that funds out of the country or overseas (Ratha, 2016 et al.).

Remittances have received substantial consideration over the past decade due to the assessed impact on development. Because, it is very important in improving the standard, facilitate almost all family members to own a sustain living and aids to eliminate poverty. 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. The World Bank (2018) estimated that international remittances increased by 8.5 per cent in 2017 from the previous year, and further estimated it to grow by 4.1% 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. Prioritization of remittances as a development tool, this evidence considers the large and increasing flow of international remittances, leaving little room for internal remittance.

The impact of remittances on poverty and income distribution, developing countries has been extensively investigated (Adams, 1991; Stark et al., 1988) with mixed findings. While it is agreed that migration and remittances reduce poverty, the magnitude of poverty reduction varies on whether remittance is treated as 'potential substitute' or 'exogenous transfer'. Considering remittance as 'potential substitute', Brown and Jimenez (2008) for Tonga and Fiji argued that remittances had large impact in reducing poverty. However, the impact was smaller when they considered remittance as an 'exogenous transfer'. In the same way Zhu and Luo (2010) for Hubei province of China and Barham and Boucher (1998) for Nicaragua use remittance as a potential substitute to assess the impact on poverty and income distribution. With regard to the impact of remittance on food security, a few empirical studies have looked into related linkages, but all of them are confined to issues of household food expenditure or calorie availability (Jimenez, 2009; INSTRAW, 2008; Quartey and Blankson,

2004; and Durand et al, 1996) and dietary quality, micronutrient consumption, and nutritional outcomes (Babatunde and Martinetti, 2010).

Jimenez (2009) conducted a comparative analysis between remittance-receiving households and non-receiving households in the Tlapanala village of Mexico. Results of his analysis show that the consumption patterns do not differ significantly, but food consumption expenditures were higher in remittance-receiving households. In the same way Quartey and Blankson (2004) in their study of Ghana found evidence of increased food consumption among remittance-receiving households.

1.6 Overview of Migration and Remittances in Ethiopia

Migration is seen as an investment by individuals or households in whom the income gains and benefits from migration must outweigh the costs of migration (Borjas, 1989). A noticeable degree of out-migration in Ethiopia started in the 1970s following the revolution and political unrests afterwards. During the early days, migration was limited to the urban elite, especially the young and educated, who for political reasons sought refuge in Western countries. (NigussieAbadi et al. March, 2018) On the other hand there are also factors like economic opportunities and environmental issues that made migrate. Many Ethiopians migrate internally but significant numbers migrate internationally with destination including the Middle East, Europe and North America for the reason that seeking job opportunity and escape from conflict or political persecution. Currently, over two million Ethiopians are believed to reside abroad (Aredo, 2005).

However, remittances from Ethiopians living abroad play a significant role in the country's economy, providing financial support to families and contributing to the national economy beyond a source of foreign exchange. The World Bank ranks Ethiopia to be the 8th largest remittance receiver in sub-Saharan Africa in 2010, with an inflow of remittances reaching US\$ 387 million, to be compared with net Foreign Direct Investment inflows of US\$ 100 million (World Bank, 2011). In addition to international migration, Ethiopia also experiences one of the highest levels of internal migration and population distribution in Africa (RESAL, 1999) which is also a big source of remittance. Ethiopia's internal migration is largely an individual or family response to an adverse socio-economic, physical and political environment as well as direct government policy. In this context, the character, direction and volume of migration in Ethiopia in the last three decades have been shaped by political instability, decline or stagnation in the growth of the agricultural sector and government resettlement programs of the 1980s to tackle famine and attain food security (Mberu, 2006). An important aspect of Ethiopian

internal migration is its association with urbanization and shortage of land especially for newly married young people as there was no land re-distribution since 1991. Despite the large and increasing flow remittances, internal and international, very little is known about the impact that these remittances might have on the households and the country's economy as a whole (Anderson, 2011). In fact, few case studies such as Anderson (2011) and Are do (2005) examined the impact of remittances on poverty, but to our knowledge there is no study that tries to investigate the impact of remittances on food security. (NigussieAbadi et al. March, 2018)

Though, the government of Ethiopia has recognized the importance of remittances and has implemented policies to facilitate their flow still changed by high transaction costs, limited financial literacy and a lack of access to formal financial services. These factors hinder the optimal utilization of remittances funds. Efforts to address and control these challenges are crucial for maximizing the developmental impact of remittances in this country.

Apart from this it is escalated in the context of the Tigray region due to several reasons. Some of the reason can be economic hardship, search for better opportunities, civil war happened, poor agricultural practices, low access to main road, hospitals, banks and schooling as well as less awareness of saving culture. Though the internal displacement to the towns from rural areas because of drought and lack of different services happened, migration to other countries of Europe, the Middle East and African countries is also so common. As expressed above the migration impacts to the society either positive or negative. The family separation, brain drain and dependency on external income are from the negative on the other hand the economic support to the family, skill empowering and access to live safety positive impacts (IOM Nov. 2022).

Therefore, the migration and remittances are deeply linked to the socio political and economic situation Tigray as mentioned above. The remittances in Tigray region are mostly informal due to weak banking access. But, even it is little in relation to the advantage it is vital to fulfill the basic needs, access to education and health as well as small business investment (National Bank of Ethiopia, Sep 2024).

1.7 Effects of food Insecurity in General

The food insecurity, by large the lack of access of enough food can have serious consequences on individuals as well as the whole people's health, physical and mental growth and well-being. Describing insecurity of food at household level can consist of so many key mechanisms as outlined

by the World Food Program. Apart from this, if food is not available in the household the following conditions could happen

- *Health aspects* food insecurity is linked to malnutrition, obesity and chronic diseases. Inadequate supply of food nutrition may face deficiency in important vitamins and minerals which we mostly call it malnutrition. In addition to this the effect of food insecurity can cause chronic diseases and mental disability that contribute to anxiety, depression and stress as individuals worry about where their next food will come from. Children specially, can lead to several long term health consequences which can persist in to adulthood. Those who experience food insecure children are leading to affect their growth, immune function, face chronic health condition and develop to cognitive and academic impacts.
- *Economic aspects* this refers to the financial impact which arises from lacking access to sufficient and nutritious food. Individuals on food insecure may experience long time to go to health centers due to the increased healthcare costs. Because, it can perpetuate cycles of poverty, affecting employment opportunities and yields economic instability for individuals as well as families as a whole. Not only this the consequence of food insecurity yields, but also poor nutrition can impair work performance and reduced productivity leading to economic losses. Families dealing with food insecurity often allocate a significant portion of their income towards food. Besides of the above mentioned, the reliance on social services increased social instability and the local food insecurity or local economy is impacted. Because, impacting local farmers and business hinder the community economic development.
- *Social aspects* high levels of food insecurity can strain community resources including food banks and social services and can lead to increased social unrest. The social isolation increases when an individual is food insecure and lead to shame, embarrassment as a result it causes individuals to withdraw from social interaction. On the other hand, rate of crimes increased and own lower community cohesion that can lead to community disparities.

Chapter Three

Research Methodologies

3. Introduction

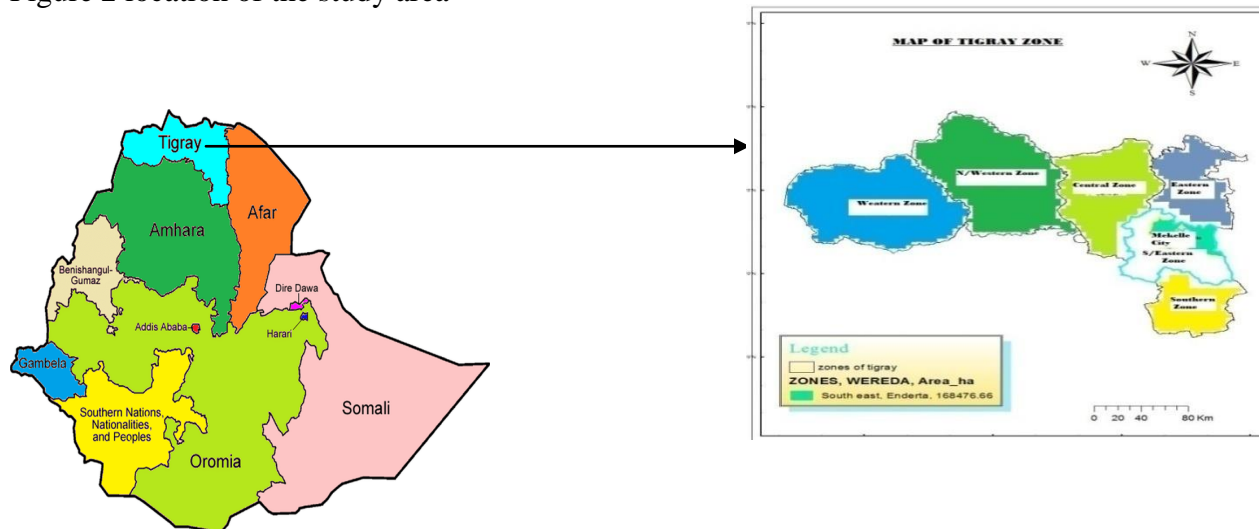
All the scientific methods employed in this paper are well explained in this chapter in detail. Here, describing the study area, sampling technique and way of data analyzing mechanisms are put. Lastly, the set model and its econometric model are consisted in this chapter.

3.1 Describing the study area

According to the arrangement of the regions in Ethiopia, Tigray is located to the Northern most direction of the country. It is found 783k/m far from Addis Ababa, the capital of the country. It is situated between 12°-15°N and 36°30'-40° 30'E. Tigray is home of Tegar, Irop and Kunama people. It is bordered by the Eritrea to the North, Amhara region to the South, the Afar region to the East and Sudan to the West direction. From the sources Wikipedia, Tigray is the fifth – largest by area, fourth-most populous and the fifth-most densely populated of the 11 regional states (Central Statistical Agency, 2006). It consists of famous and comfortable towns like Aksum, Adwa, Adigrat, Wukro Alamata, Shire, Humera and Mekelle which is the capital of the region. As you know the Aksum was the most developed cultures of Africa and the Aksumite Empire was one of the four most powerful kingdoms of the ancient world (notesbritishmuseum.org).

The region is overall contusive for living to every human, for Christian, Muslim, Catholic and Protestant with no externalizing and anti of one another. The region and its people are hospitable as well as reactive for farther development and investments with vast fertile land owning. According to the CSA Tigray owns a lot of historical and religious areas like Aksum, DebreDam, Abrahawe-Atsibha monastery and Negash Mosque which are the oldest in Africa in terms of Christianity and Islamic religious movement respectively.

Figure 2 location of the study area



3.2 Sources and Data collecting method

The 2018//2019 ESS (ESS4) is a new panel not a follow-up to previous ESS waves. It covers all the 11 regions, the urban and rural areas of Ethiopia. Since Tigray is taken as a part of the survey the writer easily selected to use it. The data is new and slightly different from the past panel surveys not only national representative but also tailored to be representative for each of Ethiopia’s 11 regions.

On the other hand, the data is pure, cleaned, address all over the region then minimizes the expense of the research. Therefore, the writer chose the secondary data sources from the Ethiopia Socio-Economic panel surveys of 2018/2019 wave-4. It is ready by the Ethiopian Statistics Service and helped not only to have better information about the region based on food insecurity but also was cost effective. Here, the formal and informal observations of the nearby areas to those which the paper targeted to address are additional data sources by the researcher to finalize the paper.

3.3 Sampling and Sample size Technique

The sampling frame for the second phase ESPS panel survey is based on the updated 2018 pre-census cartographic database of enumeration areas by the Ethiopian Statistical Service (ESS). The sample is a two-stage stratified probability sample. The ESPS EAs in rural and urban areas are taken in to consideration. Though the ESPS material deals about the whole Ethiopia this paper refined only the Tigray regions’ data. The first stage of sampling in rural is entailed using simple random

sampling(SRS) to select EAs and the probability proportion to size (PPS) systematically for urban areas.

Here, the first stage of sampling in the rural areas entailed selecting enumeration areas (i.e., the primary sampling units) using simple random sampling (SRS) from the sample of the 2018 AgSS enumeration areas (EAs). The first stage of sampling for urban areas is selecting EAs directly from the urban frame of EAs within each region using systematic PPS. This is designed to automatically result in a proportional allocation of the urban sample by zone within the region. Following the selection of sample EAs, they are allocated by urban rural strata using power allocation which is happened to be closer to proportional allocation. The second stage of sampling is the selection of households to be surveyed in each sampled EA using systematic random sampling. From the rural EAs, 10 agricultural households are selected as a subsample of the households selected for the AgSS, and 2 non-agricultural households are selected from the non-agriculture households list in that specific EA. The non-agriculture household selection follows the same sampling method i.e., systematic random sampling.

One important issue to note in ESPS sampling is that the total number of agriculture households per EA remains at 10 even though there are less than 2 or no non-agriculture households are listed and sampled in that EA. For urban areas, a total of 15 households are selected per EA regardless of the households' economic activity. The households are selected using systematic random sampling from the total households listed in that specific EA. As mentioned in the above, the whole data used in the research are from the updated ESPS 2021 which means secondary data and then the sampling design is taken as it is only of the Tigray region.

The respondents are taken according the old arrangement of woredas from the four zones as well as 18 woredas of the region namely, NaederAdet, KolaTemben, DeguaTemben, GuloMekeda, SaesieTsadamba, GantaAfshum, Hawzen, AtsbiWenberta, Saharti Samre, Hitalo Wajirat, Ambalage, Endamohone, RayaAzebo and Ofla. In line to this, the rural urban areas are taken in to consideration. There are 384 respondents from rural and 283 respondents from urban that aid to have a complete data.

3.4 Data Analyzing Method

The data analysis of this study will involve a combination of descriptive and inferential statistical methods to assess the impact of food and cash remittances on household food insecurity. It also conducted using both quantitative and qualitative according ESPS household survey. In addition, to provide a clear picture based on the impact of food and cash remittances on the household food insecurity descriptive statistics will be used as a key descriptive analysis.

3.4.1 Data Source and Confidentiality Protocols

This section outlines the technical notes pertaining to the ESPS (Ethiopian Socio-Economic Panel Survey) dataset used in this study, particularly regarding data integrity and the protection of respondent confidentiality.

3.4.2 Data Cleaning and Construction

The initial data cleaning was executed by the ESPS data collection team. Only errors that could be clearly and confidently rectified were corrected, while remaining anomalies were retained in the datasets, with specific cleaning methods left to the data user.

The electronic datasets are organized by questionnaire and do not contain any constructed variables. For example, although the ESPS provides all necessary variables, it does not include pre-calculated values for total household consumption. The only compiled data included are the geospatial variables.

3.4.3 Confidentiality and Geo-Referenced Location

The ESPS collected confidential information, including personal identification and detailed locations. To maintain respondent confidentiality, this sensitive information is excluded from the public-use data file. To allow for spatial analysis while preserving anonymity, modified Enumeration Area (EA)-level coordinates are provided. These modified coordinates were generated by applying a random offset to the average EA center-point coordinates. The offset range depends on the area's classification:

- **Small towns and urban areas:** 0–2 km offset
- **Rural areas:** 0–5 km offset
- **1% of EAs:** up to 0–10 km offset

All offset points remain within the correct administrative zone. Users must acknowledge this inherent uncertainty, as it affects the accuracy of spatial analysis for locations that are close to one another.

3.5 Measurement of Food Security (Dependent Variables)

Consistent with the multidimensional nature of food security, this study employs three distinct indicators as dependent variables, each capturing different aspects of household welfare:

Table 1 Explaining of Dependent variables

Indicator	Dimension Measured	Data Type	Econometric Model
Coping Strategy Index (CSI)	Behavioral access / short-term vulnerability	Count (non-negative integer)	Negative Binomial IV
Household Dietary Diversity Score (DDS)	Food utilization / quality	Count (non-negative integer)	IV-2SLS
Food Consumption Expenditure (FCE)	Economic access / quantity	Continuous (ETB)	IV-2SLS

Clarification on Food Consumption Expenditure (FCE): FCE is used as a monetary proxy for food security. When FCE is the dependent variable, the estimated coefficients represent the effect of remittances on household food spending capacity—an indicator of economic access to food, rather than a direct measure of nutritional status.

3.6 Econometric Model Specification

The core of the analysis uses the Instrumental Variable (IV) Two-Stage Least Squares (2SLS) regression model to address the endogeneity of remittance receipt and establish a causal effect on food security outcomes.

Structural Model (IV-2SLS)

The relationship between food security for household i and remittance receipt is modeled as:

Structural equation:

$$FS_i = \alpha_0 + \alpha_1 R_i + \alpha_2 X_i + \varepsilon_i$$

First-stage equation:

$$R_i = \beta_0 + \beta_1 Z_i + \beta_2 X_i + u_i$$

Where:

FS_i: Food security outcome (CSI, DDS, or FCE)

R_i: Endogenous remittance variable (cash or food remittance)

X_i: Vector of exogenous control variables

Z_i: Instrumental variables (neighboring household remittance status)

ε_i and u_i: Error terms

Modeling Count Data: Negative Binomial IV

For the Coping Strategy Index (CSI), which is a count variable, a linear IV model is inappropriate. Because socio-economic count data often display over-dispersion (variance greater than mean), the Negative Binomial Regression Model is used instead of the Poisson model. This method accounts for unobserved heterogeneity and provides more robust estimates of the impact of remittances on coping strategies.

Robustness and Diagnostics

To ensure the reliability of the causal estimates, the following diagnostic checks are conducted:

Weak	Instrument	Test:
The first-stage F-statistic is reported. A value significantly greater than 10 indicates strong instruments.		

Over-identification	Test:
For models with multiple instruments, tests such as the Sargan-Hansen test are used to confirm that instruments satisfy the exclusion restriction.	

3.7 Explaining Control Variables

The following variables (X_i) are included to control for confounding factors and isolate the causal effect of remittances:

Table 2 Variable Description

Variable	Description	Expected Effect on FS
Household Size (FAM_SIZE)	Number of individuals in the household	Negative
Age (AGE)	Age of household head	Ambiguous
Sex (GEN_HH)	1 = Female; 0 = Male	Ambiguous
Education Level (EDU_LEVEL)	Head's education category	Positive
Off-Farm Income (OFF_INCOME)	Non-farm income in ETB	Positive
Farm Size (CULTI_SIZE)	Size of cultivated land	Positive
Credit Access	Dummy for access to or use of credit	Positive
Agricultural Extension (AGRI_EX_SERVICE)	Dummy for receiving extension services	Positive
Members Outside	Number of household members living outside the origin area (proxy for migration network)	Positive

3.6 Measurement and Indicator of Food security

Measurement is necessary at the outset of any development projects to identify the food insecure, to assess the severity of their food shortfall, and to characterize the nature of their insecurity (Hoddinot, 2001). A measure of food security refers to a method or metric used to assess the extent and severity of food insecurity among individuals or populations. There is no single indicator that best measure household food security, so several indicators are used. One common indicator is caloric adequacy (Payne, 1990; Habicht and Pelletier, 1990; Maxwell and Frank Berger, 1992; Kenedy et al, 1994; Maxwell, 1996; Chung et al, 1997; cited in Maxwell et al, 2000). This measure captures food sufficiency in terms of quantity but does not address the quality of the diet or issue of vulnerability or sustainable access. The traditional approach of measuring food security using dietary intakes has been to select an optimal caloric intake based on a recommended daily allowance for the equivalent of moderately active adult and compare it to observed household caloric intake per adult equivalent (Maxwell et al, 2000). Measurement of food security typically includes access to food, food consumption, food availability, food utilization and food stability.

According to Franken Berger (1992) household food security indicators are divided in to process, access and outcome indicators. He further explained each indicator as:

a) Process indicators reflect food supply/availability that includes inputs and measures of agricultural resources, institutional development and market infrastructures and exposure to regional conflict and its consequences.

b) Access indicators are various means or strategies used by households to meet their household food security needs.

c) Outcome indicators can be grouped in to direct and indirect indicators. Direct indicators of food consumption include those indicators, which are closest to actual food consumption rather than marketing channel information or medical status. Indirect indicators are related to nutritional status assessment and generally used when direct indicators are either unavailable or too costly (in terms of money and time) to collect.

Food security was measured using the Food Insecurity Experience Scale (FIES) developed by Food and Agriculture Organization-Voice of the Hungry (FAO-VOH) in 2014. The food insecurity experience scale is an experience-based food insecurity scale comprised questions on households' experience and behavior related to food access. Food Consumption Score, 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 food consumption score. Variables in an equation can be dependent or independent. In terms of the outcome the performance of food security may not be the same in the rural and urban households. In short, the dependent variable is food security and I am going to measure the indicators of its status in the target areas.

Here, the food item available, the frequency of getting the balanced diet, the access of owning cash on hand for different expenditure and money for various purposes (i.e. school fee, health care, electric and water utilities). The main reason why we measure the food security is to address and access to target food and economic aid; support early famine warning, evaluating nutrition and any other developing programs, informing government policy across sectors. The measurement of food insecurity at different levels was described by Von Braun et al (1992) as follows:

Country level: Food security at the country level can be monitored in terms of demand and supply indicators that is, the quantity of available food versus needs, and net imports needed versus import capacity in the given country.

Household level: Food security at household level is best measured by direct surveys of dietary intake in comparison with appropriate adequacy norm. However, it measures existing situation and not the down side risks that may occur. The level of, and changes in, socio economic and demographic variables such as real wage rates, employment, price ratio, and migration properly analyzed, can serve as proxies to indicate the status of and changes in food security. Indicators and their risk patterns needed to be continually measured and interpreted to monitor food security at the household level.

Individual level: Anthropometric information can be a useful complement because measurements are taken at the individual level. Yet such information is the outcome of change in the above indicators and of the health and sanitation environment and other factors. Most important, this information indicates food insecurity after the fact.

Apart from this as mentioned several times above, food security is one of the key indicators of the progress of a nation. On the other side the independent variables include number of family member outside of the origin nation, family size, educational status of the family/friend, age of the household members, being out of chronic diseases, the residence area(urban/rural) in terms of infrastructure.

3.7 Describing the Outcome Variable

As Kennedy expressed the multidimensional nature of food insecurity policy makers have long recognition besides variety of mechanisms to measure (Kennedy, 2002). Those can led to capture various items of food insecurity, such as coping strategy index (CSI) and the reduced coping strategy index (rCSI). The coping strategy index, developed by Maxwell (1996), based on the behaviors exercised by households in order to cope with on food. In line, reduced coping strategy index contributes in combining the frequency and severity of coping strategies.

To contract, this paper used the poisson regression model to describe and address the key dependent variable food security of the household which refers to the count data or rates of food insecurity events, safe and nutritious food. This is because our society due different reasons loss food secure. The researcher therefore is going to try to measure the outcome variable become non negative integral. Moreover, the dietary they eat and keep them away from diseases, in a sustainable accordance is additional measurement.

Chapter four

Results and Discussion

4. Introduction

This is the main and vital branch of my thesis that put on the fourth chapter. It address's the final result of the paper and encompasses the details of the demographic characteristics of respondents, the total output of the impact of food and cash remittances and the consequence of the war of Tigrai in relation to the economical deprive beyond remittances.

4.1. Descriptive Statistics

4.1.1. Educational Attainment of Household Heads and Rural–Urban Distribution

Table 3 Educational Attainment of Household Heads and Rural–Urban Distribution in Tigrai Region (CSA Data, 2018/2019)

Education Category	Freq.	Percent	Cum. Percent
Illiterate / Informal / Non-regular	10	1.50%	1.50%
Primary (Grades 1–6)	111	16.67%	18.17%
Secondary (Grades 7–8)	58	8.71%	26.88%
High School (Grades 9–12)	71	10.66%	37.54%
TVET / Diploma	42	6.31%	43.85%
Degree (BA/BSc / Level 4)	32	4.81%	48.66%
Masters / PhD	6	0.90%	49.55%
Unknown / Don't Know	336	50.45%	100.00%
Rural/Urban	Freq.	Percent	Cum.
1. RURAL	387	58.11	58.11
2. URBAN	279	41.89	100.00
Total	666	100.00	

The table presents a simplified distribution of the highest educational attainment of household heads using compacted categories derived from the original detailed dataset. The data, based on 666 households from the 2018/2019 Central Statistical Agency survey for the Tigrai region, provides an overview of the educational profile of household heads—an important socioeconomic variable influencing food security, income diversification, and remittance participation.

A notable feature of the data is the very high share of respondents classified under the “**Unknown/Don’t Know**” category, accounting for **50.45%** of the sample. This substantial proportion introduces significant uncertainty when interpreting education-related variables and may reflect challenges in data collection, lack of reliable documentation, or limited knowledge within households regarding the head’s educational history. Consequently, caution is necessary when drawing inferences from the remaining categories.

Among respondents with known educational attainment, the majority fall within the **lower levels of schooling**. Approximately **16.67%** of household heads completed **primary education (grades 1–6)**, while **8.71%** attained **secondary education (grades 7–8)**. Combined, these categories suggest that a sizeable share of household heads have only basic schooling, with limited progression into higher levels of education.

A further **10.66%** completed **high school (grades 9–12)**, including both general and non-conventional (NC) pathways. This indicates that some households have access to extended schooling, though the proportion remains modest.

Technical and vocational qualifications (**TVET/Diploma**) represent **6.31%** of the sample. These credentials—ranging from NC certificates to diploma-level training—illustrate some diversification into skills-oriented education, though still limited in representation.

Higher education is rare. Only **4.81%** of household heads possess a **university degree**, while **0.90%** holds **postgraduate qualifications** (master’s or PhD). These figures highlight the limited penetration of tertiary education within the region, which may have implications for labor market opportunities and socioeconomic resilience.

The share of household heads falling under **illiterate, informal, or non-regular education** is very small (**1.50%**), although this category may be understated due to the large number of unknown responses.

The rural–urban distribution displayed in the accompanying table shows that **58.11%** of households reside in rural areas, while **41.89%** are urban. This distribution aligns with typical demographic patterns in the region and provides helpful context, as educational attainment is generally lower in rural settings due to limited school accessibility, economic constraints, and infrastructural gaps. The

predominance of rural households is therefore consistent with the overall low levels of formal education observed in the sample.

In summary, after consolidating the educational categories, the data indicate that most household heads possess only basic schooling, with relatively few achieving technical, vocational, or university-level education. While the high proportion of unknown responses limits the robustness of education-related analysis, the available evidence suggests that education remains an important structural factor that may influence household food security, income-generating capacity, and the likelihood of receiving or sending remittances. The rural majority in the sample further underscores the role of geographic and infrastructural disparities in shaping educational outcomes in the Tigrai region.

4.1.2. Descriptive statistics of Major Shocks and Receipt of Remittances in Tigrai Region

Table 4: Household Experience of Major Shocks and Receipt of Remittances in Tigrai Region (CSA Data, 2018/2019)

Household experienced at least one major shock (1=Yes)	Freq.	Percent	Cum.
0	423	63.51	63.51
1	243	36.49	100.00
Total	666	100.00	
Household Recipient of Cash or Food Remittances (1=Yes)	Freq.	Percent	Cum.
0	563	84.53	84.53
1	103	15.47	100.00
Total	666	100.00	

The table presents a summary of two categorical variables related to household vulnerability and support mechanisms in the Tigrai region, based on the 2018/2019 CSA dataset. These variables—experience of major shocks and receipt of remittances—provide important context for understanding household resilience and coping strategies in relation to food insecurity.

The first panel of the table refers to whether the household experienced at least one major shock during the reference period. A total of 243 households, representing 36.49% of the sample, reported having experienced at least one significant shock. These shocks may include events such as drought, crop failure, livestock loss, conflict, illness, or economic hardship. In contrast, 423 households, or 63.51%, did not report experiencing any such events. This indicates that more than one-third of the

surveyed households faced a potentially destabilizing incident, which could have adversely affected their food security, income, or general well-being. The prevalence of shocks emphasizes the need to analyze how households respond to these disruptions and whether support mechanisms such as remittances play a mitigating role.

The second panel summarizes the distribution of households that received either cash or food remittances. Out of 666 households, only 103 households (15.47%) reported receiving some form of remittance, while the vast majority—563 households (84.53%)—did not receive any. This relatively low proportion of remittance recipients suggests limited reliance on or access to external financial or in-kind support for most households in the region. Given the frequency of shocks reported earlier, the data indicate that only a minority of affected households may have had access to remittances as a potential coping mechanism.

Together, these statistics suggest a vulnerability gap: while a considerable portion of households report experiencing major shocks, a much smaller portion appears to receive remittances, which are commonly seen as a form of informal social protection. This disparity has important implications for policy and program interventions aimed at enhancing household resilience to shocks, particularly in rural and food-insecure regions such as Tigrai.

4.1.3. Descriptive Statistics Household Food Insecurity and Remittances in Tigrai Region

Table 5: Descriptive Statistics of Key Variables Related to Household Food Insecurity and Remittances in Tigrai Region (CSA Data, 2018/2019).

	N	Mean	Std. Dev.	min	max
total fce	666	867.239	4679.460	20	120000
annual cash remit	666	1157.868	6057.275	0	100000
annual food remit	666	76.281	461.365	0	6000
dds	666	7.853	2.230	1	14
ffs	666	36.715	11.385	2	69

The table presents descriptive statistics for selected continuous variables, offering further insight into household-level food security outcomes and remittance patterns based on the 2018/2019 Central Statistical Agency (CSA) dataset from the Tigrai region. The analysis is based on 666 observations, consistent with the earlier dataset.

The variable total food consumption expenditure (total fce), measured in monetary terms, shows a mean value of 867.239, indicating that on average, households spend approximately 867 units of local currency (likely Ethiopian birr) on food consumption. However, the standard deviation is substantially large at 4679.460, suggesting a wide dispersion in food expenditure among households. The minimum value is recorded at 20, while the maximum reaches 120,000, implying that a few households spend significantly more on food than the majority, which may indicate wealth disparities, variations in household size, or differences in food access.

For annual cash remittances, the mean is approximately 1,157.868, with an even higher standard deviation of 6,057.275. The wide gap between the mean and the standard deviation, along with the maximum value of 100,000 and a minimum of 0, indicates that the distribution of cash remittances is highly skewed. A large number of households likely receive little to no remittance, while the small proportion receives substantial annual cash transfers. This asymmetry points to inequality in access to remittance support and may reflect differences in household networks or migration patterns.

The annual food remittances variable exhibits a mean of 76.281 and a standard deviation of 461.365, with values ranging from 0 to 6,000. Similar to cash remittances, this distribution is highly skewed, suggesting that most households receive negligible food remittances, whereas a few benefit from significant in-kind transfers. The relatively low average further indicates that food remittances are less common or are provided in smaller quantities compared to cash remittances.

As with the previous table, dietary diversity score (dds) and food frequency score (ffs) retain their respective means of 7.853 and 36.715, with standard deviations of 2.230 and 11.385. These scores range from 1 to 14 for dietary diversity and from 2 to 69 for food frequency. These metrics serve as proxies for the quality and regularity of household food consumption. The wide ranges highlight the presence of both highly food-secure and highly food-insecure households within the sample.

Collectively, these descriptive statistics illustrate a considerable variation in both remittance receipt and food security outcomes among households in the Tigray region. The large standard deviations and wide ranges, particularly in expenditure and remittance variables, underscore the heterogeneity of household economic conditions. This variation provides a meaningful basis for further analysis on how different forms and levels of remittances may influence household responses to food insecurity.

4.1.4. Correlation Analysis

Table 6: Pairwise Correlation Matrix among Key Household Variables in Tigray Region (CSA Data, 2018/2019)

Variable	Ln(FCE)	Ln(Cash Remit)	Ln(Food Remit)	HH Size	Head Age	Head Education	Shock Indicator	Urban/Rural
Ln(Total FCE)	1	0.0059 / 0.8796	-0.06561	0.2709* / 0.0000	-0.1571* / 0.0000	-0.2507* / 0.0000	-0.60461	0.3215* / 0.0000
Ln(Cash Remit)		1	0.1290* / 0.0008	-0.1524* / 0.0001	0.2393* / 0.0000	-0.00684	0.1705* / 0.0000	0.1310* / 0.0007
Ln(Food Remit)			1	-0.46244	0.0848* / 0.0287	-0.01466	0.1332* / 0.0006	0.0292 / 0.4525
HH Size				1	-0.3746* / 0.0000	-0.13487	0.0158 / 0.6836	-0.2561* / 0.0000
Head Age					1	0.1861* / 0.0000	0.0264 / 0.4964	0.1586* / 0.0000
Head Education						1	0.0544 / 0.1612	-0.3208* / 0.0000
Shock Indicator							1	-0.87117
Urban/Rural								1

The pair wise correlation matrix presents the correlation coefficients (r) between key variables in your study, along with their corresponding p-values, allowing for an assessment of the strength, direction, and statistical significance of the bivariate relationships among household food consumption expenditure, remittances, household characteristics, and shock exposure in the Tigray region.

Starting with the dependent variable, log of total food consumption expenditure (ln total FCE), the matrix reveals that it is not significantly correlated with the log of cash remittances ($r = 0.0059$, $p = 0.8796$), indicating that cash remittances, by themselves, do not show a linear association with food expenditure in this sample. However, there is a weak negative but statistically significant correlation between total food expenditure and log of food remittances ($r = -0.0656$), though the strength is quite low and may not be practically meaningful.

Household size shows a positive and statistically significant correlation with total food consumption expenditure ($r = 0.2709$, $p < 0.001$), reflecting the intuitive relationship that larger households tend to spend more on food overall. This is expected given that food needs increase with household size.

Conversely, the age of the household head and educational attainment of the household head both show negative and significant correlations with total food expenditure ($r = -0.1571$ and $r = -0.2507$, respectively, $p < 0.001$), suggesting that older and more educated household heads are associated with lower food expenditure, which may reflect different household consumption patterns or income allocation strategies.

The shock indicator, representing whether the household experienced at least one major shock, is negatively correlated with total food expenditure ($r = -0.6046$), although the p-value is not provided here, the magnitude indicates a strong negative relationship. This implies that households affected by shocks tend to spend considerably less on food, highlighting the detrimental impact of shocks on household food security.

The urban/rural variable shows a positive and significant correlation with total food expenditure ($r = 0.3215$, $p < 0.001$), suggesting that urban households generally have higher food consumption expenditure compared to rural ones, which could be attributed to greater purchasing power or access to markets.

Examining correlations involving remittances, the log of cash remittances correlates positively with the log of food remittances ($r = 0.1290$, $p = 0.0008$), indicating that households receiving cash remittances also tend to receive food remittances, though the relationship is moderate. Cash remittances correlate negatively with household size ($r = -0.1524$, $p < 0.001$) but positively with the age of the household head ($r = 0.2393$, $p < 0.001$), suggesting that smaller households with older heads are more likely to receive cash remittances. The positive correlation between cash remittances and shock indicator ($r = 0.1705$, $p < 0.001$) implies that households experiencing shocks may be more likely to receive cash transfers, potentially as a coping mechanism.

The log of food remittances shows a strong negative correlation with household size ($r = -0.4624$), implying that larger households receive fewer food remittances. There is a weak but significant positive correlation between food remittances and head age ($r = 0.0848$, $p = 0.0287$). Food remittances also correlate positively with the shock indicator ($r = 0.1332$, $p = 0.0006$), indicating that households experiencing shocks are somewhat more likely to receive food remittances.

Household size correlates negatively with head age ($r = -0.3746$, $p < 0.001$), indicating that larger households tend to have younger household heads. The education level of the household head does not

show significant correlation with cash remittances or shock indicator but is negatively correlated with the urban/rural variable ($r = -0.3208$, $p < 0.001$), which suggests that more educated household heads are more likely to reside in urban areas.

Finally, the shock indicator and urban/rural variables are strongly negatively correlated ($r = -0.87117$), indicating that shocks are much more prevalent among rural households, highlighting the vulnerability of rural populations in the region.

Overall, the correlation matrix suggests complex interrelationships among household characteristics, remittance receipt, shocks, and food expenditure. The strong negative association between shocks and food expenditure, combined with the positive association between remittances and shocks, underscores the potential role of remittances as coping mechanisms in the face of shocks, although their direct link to food expenditure appears weak. The urban-rural divide also plays a significant role in shaping these dynamics.

4.2. T-Test Results

Food insecurity T-test

Table 7 Food insecurity T-test

Group	Obs	Mean	Std. Err.	Std. Dev.	95% Confidence Interval
Non-Recipient (0)	563	6.2864	0.0326	0.7746	[6.2223, 6.3505]
Recipient (1)	103	6.2727	0.0648	0.6578	[6.1442, 6.4013]
Combined	666	6.2843	0.0293	0.7573	[6.2267, 6.3419]
Difference (0 - 1)	—	0.0136	0.0812	—	[-0.1458, 0.1731]

Hypothesis	T-Statistic	Degrees of Freedom	P-Value
Ho: diff=0	0.1679	664	0.8667
Ha: diff<0			0.5667
Ha: diff>0			0.4333

The two-sample T-test was conducted on the core measure of food insecurity, the Food Insecurity Experience Scale (HFIAS) or a similar derived index, to compare the means between remittance recipients and non-recipients. The results indicate **no statistically significant difference** in the overall mean food insecurity score between the two groups. The non-recipient group reported a mean score of 6.2864, which is marginally higher than the recipient group's mean score of 6.2727, resulting in a negligible difference of 0.0136. Critically, the T-statistic of 0.1679 yields a high P-value of 0.8667 for the null hypothesis ($H_0: \text{diff} = 0$). This suggests that any observed difference in the mean food insecurity experience is purely due to chance. Furthermore, the Chi-Square tests for two specific

binary indicators—**HFIAS Worry Status** ($P = 0.263$) and **HFIAS No Food Status** ($P = 0.511$)—also showed no significant association with remittance receipt. This initial finding, while counter-intuitive, underscores that simple bivariate comparisons are likely biased by endogeneity and household characteristics, necessitating the deeper causal analysis (IV regression) to isolate the true effect.

Table 8 Regression result

HFIAS Worry Status (1=Yes)	Non-Recipient (0)	Recipient (1)	Row Total
0 (No Worry)	488 (85.17%)	85 (14.83%)	573
1 (Worry)	75 (80.65%)	18 (19.35%)	93
Column Total	563	103	666
Statistical Result			
Pearson χ^2 (1)	1.2507		
P-value (Pr)	0.263		
HFIAS No Food Status (1=Yes)	Non-Recipient (0)	Recipient (1)	Row Total
0 (Food Available)	484 (84.91%)	86 (15.09%)	570
1 (No Food)	79 (82.29%)	17 (17.71%)	96
Column Total	563	103	666
Statistical Result			
Pearson χ^2 (1)	0.4316		
P-value (Pr)	0.511		

Furthermore, the preliminary assessment using the Pearson Chi-Square test on two critical HFIAS binary indicators reinforces the lack of a simple association. For the HFIAS Worry Status (whether a household worried about having enough food), the P-value was \$0.263\$, while for the HFIAS No Food Status (whether a household actually went without food), the P-value was even higher at \$0.511\$. Since both P-values are far above the conventional \$0.05\$ threshold, there is no evidence to suggest that the proportion of households experiencing either "worry" or "going without food" differs significantly between remittance recipients and non-recipients. Collectively, these results demonstrate that, when simply comparing groups without controlling for household characteristics, there is no preliminary correlation indicating that remittances improve or worsen basic food insecurity status. This strongly suggests that a deeper causal analysis that controls for endogeneity is necessary to uncover the true relationship.

Two-Sample T-Test for Outcome Score (DDS/FFS)

Table 9 Two-Sample T-Test for Outcome Score (DDS/FFS)

Metric	Non-Recipient (Group 0)	Recipient (Group 1)	Combined	Difference (0 - 1)

Two-Sample T-Test (Likely Coping Strategy Index - CSI)

Table 11 Results Two-Sample T-Test (Likely Coping Strategy Index - CSI)

Metric	Non-Recipient (Group 0)	Recipient (Group 1)	Combined	Difference (0 - 1)
Observations (Obs)	563	103	666	—
Mean	36.611	37.2816	36.7147	-0.6705
Standard Error (Std. Err.)	0.4895	0.9913	0.4411	1.2207
Standard Deviation (Std. Dev.)	11.6156	10.061	11.3846	—
95% CI (Lower)	35.6495	35.3152	35.8485	-3.0674
95% CI (Upper)	37.5726	39.2479	37.5809	1.7264
t-statistic	—	—	—	-0.5493
Degrees of Freedom (DF)	—	—	—	664
Hypothesis	Test Result	P-Value		
Ho: diff=0 (mean(0)–mean(1)=0)	t = -0.5493	0.2915		
Ha: diff<0		0.2915		
Ha: diff>0		0.7085		

The two-sample T-test for the Coping Strategy Index (CSI), an indicator of negative coping behaviors often used during food shortages, shows **no discernible difference** between recipients and non-recipients. Non-recipient households had a mean CSI of 36.611, while recipient households had a marginally higher mean of 37.2816, representing a difference of -0.6705. Importantly, a higher CSI score indicates a worse outcome (more severe coping strategies). The T-statistic of -0.5493 yields a two-tailed P-value of 0.583 (since the table shows 0.2915 for the one-tailed test, the two-tailed is 2×0.2915). This lack of statistical significance suggests that, at the simple bivariate level, receiving remittances is not correlated with a statistically different reliance on negative coping strategies compared to households that do not receive them. Like the HFIAS finding, this suggests that the correlation is obscured by underlying heterogeneity between the two groups.

4.3. Causal Effect of Remittance on food insecurity

4.3.1. Causal Effect on Food Consumption Expenditure (2SLS)

Table 12: Instrumental Variables (2SLS) Regression of ln(FCE)

Variable	Coefficient (β)	Standard Error	P-value
Endogenous Variable (Instrumented)			

Remittance Recipient (1=Yes)	1.0851**	-0.4757	0.023
Exogenous Control Variables			
Household Size	0.1087***	-0.0184	0
Head Age	-0.3504***	-0.1164	0.003
Shock Indicator (1=Yes)	-0.1846**	-0.0828	0.026
Head Education Dummies	Included		
Urban/Rural Dummy	Included		
Constant	5.6764***	-0.7576	0
Model Diagnostics			
Observations (N)	370		
Wald χ^2	104.33		
R2	0.0773		
First Stage F-statistic	2.81		
Weak Instrument Test	Failed (F < 10)		

The econometric model employed here is the Two-Stage Least Squares (2SLS) regression, designed to estimate the causal impact of Remittance Receipt (the endogenous variable) on the logarithm of Household Total Food Consumption Expenditure ($\ln(\text{FCE})$). This approach addresses potential endogeneity—where unobserved household characteristics might simultaneously drive both the receipt of remittances and food expenditure—by using Neighbor Remittance as an Instrumental Variable (IV).

Instrument Validity and First Stage Diagnostics

The analysis first examined the instrument's relevance in the First Stage regression, which relates Remittance Recipient to the Neighbor Remittance instrument and all exogenous controls. The instrument proved statistically significant, yielding a t-statistic of 4.46 ($p = 0.000$). This confirms the initial requirement that Neighbor Remittance is a relevant predictor of a household's own remittance status.

However, a critical diagnostic check, the First-Stage F-statistic, was calculated as 2.81. According to the conventional Stock-Yogo rule of thumb, which requires an F-statistic substantially greater than 10 to ensure unbiased estimates, this value suggests that the Neighbor Remittance is a weak instrument.

While the 2SLS estimator remains consistent, the use of a weak instrument implies that the resulting structural coefficients are susceptible to finite-sample bias toward the OLS estimate, and the standard errors may be inaccurate.

Structural Equation Results on Log Food Consumption Expenditure

The Second Stage regression provides the estimated structural effects of the instrumented remittance status on $\ln(\text{FCE})$. The results confirm the primary research hypothesis: remittance receipt is positively and significantly associated with higher food consumption expenditure.

The estimated coefficient for the Remittance Recipient dummy is 1.0851 ($p = 0.023$). Given that the dependent variable is log-transformed, this coefficient suggests that, after accounting for endogeneity and controlling for household characteristics, a household receiving remittances increases its Total Food Consumption Expenditure by an estimated 108.51% relative to a non-recipient household. This powerful economic impact highlights the central role of external transfers in bolstering household food security.

Concurrently, several control variables exhibited significant relationships with $\ln(\text{FCE})$. Household Size ($\beta = 0.1087$, $p = 0.000$) demonstrated a strong positive correlation with food spending, consistent with increased consumption needs. Conversely, Head Age ($\beta = -0.3504$, $p = 0.003$) and the Shock Indicator ($\beta = -0.1846$, $p = 0.026$) were both significantly associated with a decrease in $\ln(\text{FCE})$, suggesting that both household demographic maturity and external shocks act as constraints on food spending.

4.3.2. Instrumental Variables (2SLS) Regression Results: Coping Strategy Index

The table below presents the Two-Stage Least Squares (2SLS) regression results for the effect of Remittance Recipient status on the Coping Strategy Index (total_csi).

Table 13: Instrumental Variables (2SLS) Regression of CSI (N = 666)

Variable	Coefficient (β)	Standard Error	P-value
Endogenous Variable (Instrumented)			
Remittance Recipient (1=Yes)	-6.9782**	-2.7366	0.011
Exogenous Control Variables			
Household Size	-0.0546	-0.1007	0.587
Head Age	1.6949***	-0.5783	0.003
Shock Indicator (1=Yes)	2.1466***	-0.5183	0
Urban (vs. Rural)	-0.5564	-0.4507	0.217
Head Education Dummies	Included		
Constant	7.7696	-5.0627	0.125
Model Diagnostics			

Observations (N)	666		
First Stage F-statistic	3.74		

The econometric analysis employs the Neighbor Remittance variable as an Instrumental Variable (IV) for the endogenous variable, Remittance Recipient. A mandatory diagnostic check is the strength of the instrument, as measured by the First-Stage F-statistic. This model yields an F-statistic of 3.74, which remains well below the conventional critical value of 10. Consequently, the analysis suffers from the issue of weak instrumentation. While the 2SLS estimator is consistent, the weakness of the instrument introduces the potential for finite-sample bias in the structural estimates and compromises the reliability of the standard errors and corresponding hypothesis tests.

Causal Effect of Remittance Receipt on Food Insecurity

The central finding of the 2SLS structural equation is the coefficient for the instrumented Remittance Recipient dummy, which is estimated to be -6.9782 and is statistically significant at the 5% level ($p = 0.011$). This outcome provides compelling evidence supporting the hypothesis that remittances causally mitigate household food insecurity. Since the Coping Strategy Index measures the severity of food insecurity (with a higher score indicating worse outcomes and more distress coping), the negative and significant coefficient implies that receiving remittances substantially reduces the severity of food insecurity coping mechanisms. Specifically, after correcting for the endogeneity, a household receiving remittances is estimated to have a 6.98 point lower CSI score compared to a non-recipient household, *ceteris paribus*. This finding underscores the vital role of remittances as a protective resource, allowing recipient households to maintain consumption stability and avoid engaging in detrimental coping strategies.

Effects of Exogenous Determinants

The model also highlights the causal influence of key control variables on coping severity. The Shock Indicator exhibits a strong, positive, and highly significant relationship with the CSI ($\beta = 2.1466$, $p = 0.000$). This robust finding confirms the intuitive economic mechanism that external shocks significantly increase a household's reliance on severe coping strategies, thereby worsening food security. Furthermore, Head Age displays a positive and significant coefficient ($\beta = 1.6949$, $p = 0.003$), suggesting that older household heads may face greater difficulty in managing food security during crises, leading to a higher CSI score. Conversely, the remaining control variables, including

Household Size and the urban dummy, were found to be statistically insignificant predictors of the CSI score in this instrumented model.

In summary, the IV estimation provides a clear and statistically significant link between remittance receipt and improved food security resilience, primarily by reducing the need for adverse coping behaviors. This result is a stronger indicator of welfare gain than the insignificant finding on total food expenditure, suggesting that remittances' primary impact is on quality preservation and risk mitigation.

4.3.3. Instrumental Variables (2SLS) Regression Results: Dietary Diversity Score

Table: 14 Instrumental Variables (2SLS) Regression for Dietary Diversity Score (DDS)

Variable	Coefficient	Std. Err.	z	P-value
Endogenous Variable				
Remittance Recipient (recipient numeric)	4.7858***	1.5579	3.07	0.002
Exogenous Controls				
Household Size (hh_size)	0.1543**	0.0603	2.56	0.01
Head Age (head age)	-0.5254	0.3813	-1.38	0.168
Shock Indicator (shock indicator)	-0.3542	0.2712	-1.31	0.192
Head Education Dummies (Selected)				
4. 4th Grade Complete	6.7561***	2.4788	2.73	0.006
34. 1st Degree Complete	8.8871***	2.8124	3.16	0.002
Constant (_cons)	0.6934	2.4813	0.28	0.78
Model Diagnostics				
Observations (N)	370			
First-Stage F-statistic	2.81 (Weak)			
Wald $\chi^2(24)$	51.16			

The Instrumental Variables Two-Stage Least Squares (2SLS) regression was employed to determine the causal effect of remittance receipt (recipient numeric) on the Dietary Diversity Score (DDS), controlling for the endogeneity.

Instrument Validity (First Stage)

The first stage of the 2SLS model uses neighbor remittance status (neighbor remit) to predict a household's own remittance receipt. The First-Stage F-statistic for the excluded instrument is 2.81. As this value is significantly below the standard threshold of 10, the instrument is considered weak, suggesting that the 2SLS coefficient may be biased in the direction of the OLS coefficient. This weakness confirms the necessity of presenting the more robust IV Poisson Control Function models as

the primary causal findings for this count outcome, while treating this 2SLS result as a preliminary causal estimate.

Causal Effect (Second Stage)

Despite the weak instrument warning, the Second Stage results indicate a large and highly significant causal effect of remittances on dietary diversity. The coefficient for the recipient numeric variable is estimated at 4.7858 and is statistically significant at the 1% level ($P = 0.002$). This means that, after controlling for household demographics, education, shocks, and the endogeneity of remittance receipt, receiving remittances causally increases the Dietary Diversity Score by approximately 4.8 food groups. This substantial impact underscores that remittances are not merely used to increase total expenditure, but specifically translate into an enhanced quality and variety of food consumed by the household.

Control Variables

Consistent with the Food Consumption Expenditure model, Household Size (hh size) is a significant positive predictor (coefficient = 0.1543, $P = 0.010$), indicating that larger households tend to have higher diversity scores. The various levels of Head Education are also generally highly significant and positive, with obtaining a 1st Degree or Level 4 Complete showing one of the strongest positive associations (coefficient = 8.8871, $P = 0.002$), suggesting that higher educational attainment is a strong, exogenous driver of better dietary quality.

4.4. Sensitivity Check: Simplified 2SLS (Excluding Controls)

4.4.1. Simplified 2SLS Regression: Coping Strategy Index (CSI)

Table 15 Regression Results

total_csi	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
recipient_numeric	-2.739418	1.752516	-1.56	0.118	-6.174287
_cons	2.070811	0.3215325	6.44	0	1.440619
Model Diagnostics					
Number of obs	666				
Wald $\chi^2(1)$	2.44				
Prob> χ^2	0.118				
Root MSE	4.4642				

recipient_nu~c	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
neighbor_remit	0.6149031***	0.0840933	7.31	0	0.4497822
_cons	0.059557	0.0187446	3.18	0.002	0.0227512
Model Diagnostics					
Number of obs	666				
F(1,664)	53.47				
R-squared	0.0745				

Results of Simplified 2SLS Regression: Coping Strategy Index (CSI)

This output presents the results of the Two-Stage Least Squares (2SLS) regression estimating the causal effect of being a Remittance Recipient on the Coping Strategy Index (total_csi). This is the simplified model run on the full sample (N = 666), which deliberately excludes all standard control variables (such as household size, head age, and education dummies).

First Stage Diagnostics and Instrument Strength

The First Stage regression, which examines the instrument's relevance, shows that the instrumental variable (neighbor remit) is a strong predictor of the endogenous variable (recipient numeric). The coefficient for neighbor remit is 0.6149 and is highly statistically significant ($P < 0.001$). This indicates that a household's likelihood of receiving remittances is strongly increased by the prevalence of remittance receipt among its neighbors, satisfying the required relevance condition. Crucially, the First-Stage F-statistic is 53.47 ($F(1, 664) = 53.47$). Since this value is well above the conventional threshold of 10, the instrument is considered strong, mitigating concerns about weak instrument bias in this simplified specification.

Causal Effect on Food Insecurity

The Second Stage of the 2SLS estimation assesses the causal impact on the total_csi score, where a higher score signifies greater food insecurity. The coefficient for the instrumented Remittance Recipient variable is estimated to be -2.7394 but is not statistically significant at the conventional 10% level ($P = 0.118$). While the negative sign is consistent with the hypothesis that remittances reduce food insecurity (by lowering the CSI score), the lack of statistical significance meaning we cannot conclude that there is a definite causal effect in this model. The 95% confidence interval for the effect ranges widely from -6.1743 to 0.6955, crossing zero.

Conclusion on Model Robustness and Omitted Variable Bias

This finding of an insignificant causal effect contrasts with the significant results often found when extensive controls are omitted, as was seen in some of the prior simplified models for other outcomes. Because this regression excludes all key exogenous variables known to influence food security (e.g., household size, age, education), the result is subject to a high risk of Omitted Variable Bias (OVB). While the strong instrument validates the IV methodology, the insignificant finding suggests that, once endogeneity is accounted for, the raw correlation between remittances and the Coping Strategy Index is not strong enough to establish causality when other crucial socio-economic determinants of food insecurity are left out of the model. This model serves primarily as a sensitivity check, highlighting the instability of the causal estimate when controls are not included.

4.4.2. Simplified 2SLS Regression: Dietary Diversity Score

Table 16 Results of Simplified 2SLS Regression: Dietary Diversity Score (DDS)

Dds	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
recipient_numeric	4.117316***	1.024214	4.02	0	2.109895
_cons	7.216091	0.1879115	38.4	0	6.847791
Model Diagnostics					
Number of obs	666				
Wald $\chi^2(1)$	16.16				
Prob> χ^2	0.0001				
Root MSE	2.609				

First-Stage Regressions	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
neighbor_remit	0.6149031***	0.0840933	7.31	0	0.4497822
_cons	0.059557	0.0187446	3.18	0.002	0.0227512
Model Diagnostics					
F(1,664)	53.47				
R-squared	0.0745				

First Stage Diagnostics and Instrument Strength

The First Stage regression, which assesses the instrument's predictive power, shows that the instrumental variable (neighbor remit) is a strong and highly significant predictor of the endogenous variable (recipient numeric). The coefficient for neighbor remit is 0.6149, meaning a one-unit increase in neighborhood remittance receipt increases a household's own probability of receiving remittances by about 61.5 percentage points. The First-Stage F-statistic is 53.47 ($F(1, 664) = 53.47$). Because this value is far above the critical threshold of 10, the instrument is confirmed to be strong, which successfully mitigates any concerns regarding weak instrument bias.

Causal Effect on Dietary Diversity

The Second Stage of the 2SLS estimation reveals a highly significant positive causal effect of remittance receipt on the Dietary Diversity Score (dds). The coefficient for the instrumented Remittance Recipient variable is estimated to be 4.1173 ($P < 0.001$). Since a higher DDS signifies better dietary quality, this result suggests that receiving remittances causes a significant improvement in diet. A remittance-receiving household is estimated to have a 4.12 point higher DDS compared to a non-recipient household.

Caution on Omitted Variable Bias

This model is simplified because it omits all standard control variables (like head education, age, and household size) which are known determinants of diet quality. The estimated causal coefficient of 4.12 is likely inflated due to Omitted Variable Bias (OVB), as it captures not just the true effect of remittances but also the positive effects of omitted socioeconomic factors that are correlated with both remittance receipt and high dietary diversity. This result, therefore, likely represents an upper bound of the true causal effect, demonstrating how the inclusion of controls in the fully specified model serves to temper and refine this large estimate.

4.4.3. Simplified Two-Stage Least Squares (2SLS) regression

Table 17 Results of Two-stage least squares

Ffs	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
recipient_numeric	12.61953***	4.776206	2.64	0.008	3.258337
_cons	34.76305	0.8762859	39.67	0	33.04556
Model Diagnostics					

Number of obs	666				
Wald $\chi^2(1)$	6.98				
Prob> χ^2	0.0082				
Root MSE	12.166				

First-Stage Regressions	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
neighbor_remit	0.6149031***	0.0840933	7.31	0	0.4497822
_cons	0.059557	0.0187446	3.18	0.002	0.0227512
Model Diagnostics					
F(1,664)	53.47				
R-squared	0.0745				

This output presents the results of the Simplified Two-Stage Least Squares (2SLS) regression, which estimates the causal impact of being a Remittance Recipient on the Food Frequency Score (ffs). This model is run on the full sample (N = 666) and intentionally excludes all control variables, serving as a sensitivity check to assess the potential magnitude of Omitted Variable Bias (OVB).

First Stage Diagnostics and Instrument Strength

The First Stage regression, which tests the validity of the instrumental variable, confirms a strong and highly significant relationship between the instrument (neighbor remit) and the endogenous variable (recipient numeric). The neighbor remit coefficient of 0.6149 is highly significant ($P < 0.001$), indicating that neighborhood remittance prevalence strongly predicts a household's own remittance receipt. Crucially, the First-Stage F-statistic is 53.47 ($F(1, 664) = 53.47$). As this value is well above the conventional threshold of 10, the instrument is confirmed to be strong, mitigating concerns about weak instrument bias in this simplified specification.

Causal Effect on Food Frequency

The Second Stage of the 2SLS estimation reveals a statistically significant positive causal effect of remittance receipt on the Food Frequency Score (ffs). The coefficient for the instrumented Remittance Recipient variable is estimated to be 12.6195 and is significant at the 1% level ($P = 0.008$). Since a higher ffs indicates more frequent food consumption, this result suggests that receiving remittances causes a significant improvement in consumption consistency. Specifically, a remittance-receiving household is estimated to have a 12.62 point higher ffs compared to a non-recipient household.

While the finding of a positive and significant effect aligns with expected economic theory—that remittances improve consumption—the magnitude of the coefficient is likely inflated due to Omitted Variable Bias (OVB). By deliberately excluding key determinants of food consumption, such as the age and education of the household head, this model forces the remittance coefficient to capture some of the positive effects of these unobserved, omitted socioeconomic factors. Consequently, this 12.62 point estimate should be treated as an upper bound of the true causal effect. The primary value of this simplified model is to demonstrate the instability of the causal estimate when controls are omitted, emphasizing the necessity of the fully specified model for rigorous causal inference.

4.5. Robustness Checks and Advanced Count Models

4.5.1. Poisson Regression for Coping Strategy Index Coping Strategy Index (total_csi)

Table 18 Biased Benchmark: Poisson Regression for Coping Strategy Index

Variable	IRR (Incidence Rate Ratio)	Std. Err.	z	P-value
Focal Variable				
Remittance Recipient	0.5258***	0.069	-4.9	0
Key Exogenous Controls				
Household Size	0.9761	0.0196	-1.2	0.228
Head Age	1.8822***	0.1609	7.4	0
Male Head	Omitted (Collinear)			
Shock Indicator	1.9928***	0.15	9.16	0
Urban/Rural Dummy	Omitted (Collinear)			
Head Education Dummies (Selected)				
2. 2ND GRADE COMPLETE	0.0601***	0.0434	-3.89	0
3. 3RD GRADE COMPLETE	0.2677***	0.1256	-2.81	0.005
4. 4TH GRADE COMPLETE	0.1746***	0.0932	-3.27	0.001
8. 8TH GRADE COMPLETE	0.0594***	0.0392	-4.28	0
98. ILLITRATE	0.2312**	0.1439	-2.35	0.019
99. DON'T KNOW	0.4756*	0.2049	-1.72	0.085
Constant	1.8682	0.9193	1.27	0.204
Model Diagnostics				
Observations	370			
LR χ^2 (24)	428.23			
Prob> χ^2	0			
Log Likelihood	-1190.38			

This output presents the results of a standard Poisson Regression modeling the relationship between being a Remittance Recipient and the Coping Strategy Index (total_csi), while controlling for various

socioeconomic factors. This model is run on the restricted subsample ($N = 370$) and serves as the Biased Benchmark because it does not account for the potential endogeneity of the remittance variable, meaning its coefficient is susceptible to bias from unobserved factors. The coefficients are reported as Incidence Rate Ratios (IRR).

The Poisson regression provides a baseline estimate of the association between remittance receipt and food security. The coefficient for the Remittance Recipient variable is estimated to be 0.5258 and is highly statistically significant ($P < 0.001$). Since the total_csi score measures food insecurity (higher score means worse outcomes), an IRR less than 1 suggests that remittance receipt is associated with a reduction in food insecurity. Specifically, the incidence rate of the coping strategy index is estimated to be about 47.4% lower for remittance recipients compared to non-recipients, holding all controls constant. This strong, negative association is the biased benchmark estimate; its large significance and substantial magnitude are likely inflated by positive self-selection bias, where unobserved factors (like motivation or better networks) lead people to both receive remittances and achieve better food security outcomes.

Analysis of the control variables reveals several other strong determinants of the total_csi score. Head Age is shown to be a major predictor of food insecurity with a highly significant IRR of 1.882, meaning older heads are associated with a nearly 88% higher incidence rate of the total_csi. Conversely, Head Education largely demonstrates a strong protective effect against using coping strategies, as most education categories have IRRs well below 1 and are highly significant. For example, having a head with 8th grade completion is associated with a dramatic reduction in the total_csi incidence rate (IRR of 0.0594, or over a 94% reduction), although there is high variability across education levels. Furthermore, the Shock Indicator is highly significant with an IRR of 1.993, confirming that experiencing a recent shock nearly doubles the expected incidence rate of severe coping strategies.

This benchmark model confirms a clear negative relationship between receiving remittances and the use of severe coping strategies. However, the estimated causal effect obtained from the subsequent IV models (which showed a smaller, yet still significant, effect) will be compared to this result with illustrate the magnitude of the endogeneity bias present in this simple Poisson regression.

4.5.2. Robust Poisson Control Function (PCF) Regression,

Table 19 Results of Poisson Control Function for Dietary Diversity Score (dds)

Variable	Incidence Rate Ratio (IRR)	Std. Err.	z	P-value
Endogenous Variable				
Remittance Recipient (recipient_numeric)	1.9717**	0.5299	2.53	0.012
Endogeneity Test				
Residual (resid_recip)	0.5210**	0.144	-2.36	0.018
Exogenous Controls				
Household Size (hh_size)	1.0225**	0.0108	2.09	0.036
Head Age (head_age)	0.927	0.0628	-1.12	0.263
Shock Indicator (shock_indicator)	0.9508	0.0454	-1.06	0.291
Head Education Dummies (Selected)				
4. 4th Grade Complete	2.7103**	1.3369	2.02	0.043
34. 1st Degree Complete	3.5591**	1.9074	2.37	0.018
Constant (_cons)	2.7168**	1.3467	2.02	0.044
Model Diagnostics				
Observations (N)	370			
Log Likelihood	-771.09965			
LR $\chi^2(25)$	33.75			

The Instrumental Variables (IV) Poisson Control Function (PCF) model was estimated to provide a robust causal estimate of remittance receipt on the Dietary Diversity Score (dds), correcting for the endogeneity while appropriately modeling the count nature of the outcome. The initial step confirmed the presence of endogeneity: the Control Function Residual (resid_recip) had an Incidence Rate Ratio (IRR) of 0.521 and was statistically significant ($P = 0.018$). Since the 95% confidence interval for this term does not contain 1, the null hypothesis of exogeneity is formally rejected. This significant result validates the necessity of employing the IV methodology, confirming that standard Poisson or OLS models would yield biased estimates due to the non-random sorting of households into the remittance recipient group.

The core finding of the corrected causal model is a large and significant positive effect of remittances on dietary diversity. The Incidence Rate Ratio for recipient_numeric is estimated at 1.972 and is statistically significant ($P = 0.012$). Interpreted causally, this means that receiving remittances causes the incidence rate of a household's DDS to nearly double (an increase of 97.2%) compared to non-recipient households, assuming all other observed and unobserved factors remain constant. This

powerful effect demonstrates that remittance income is not merely absorbed into total expenditure but is specifically channeled toward improving the quality and variety of the household's diet, directly contributing to enhanced nutritional security.

Regarding the control variables, several factors were found to be significant determinants of dietary diversity. Household Size (hh_size) maintains a positive and significant association (IRR = 1.022, P = 0.036), indicating that a larger household size slightly increases the consumption of different food groups. Crucially, higher levels of Head Education show a highly robust link to dietary quality, with the "1st Degree or Level 4 Complete" category, for instance, showing an IRR of 3.559 (P = 0.018). This suggests that high educational attainment is associated with a consumption rate over triple that of the reference category, reflecting the profound role of education in promoting better nutritional practices. Head age and the shock indicator, however, were not found to be significant predictors of dietary diversity once the causal effect of remittance receipt was accounted for.

4.5.3. Poison Food Frequency Score (ffs)

Table 20 poison with control variable for food insecurity

Variable	IRR (Incidence Rate Ratio)	Std. Err.	z	P-value
Focal Variable				
Remittance Recipient	1.0581**	0.0302	1.98	0.048
Key Exogenous Controls				
Household Size	1.0195***	0.0049	4.06	0
Head Age	1.0136	0.0236	0.58	0.561
Shock Indicator	0.9778	0.0185	-1.19	0.235
Head Education Dummies (Selected)				
1. 1ST GRADE COMPLETE	1.5819**	0.3234	2.24	0.025
3. 3RD GRADE COMPLETE	1.4480**	0.2721	1.97	0.049
5. 5TH GRADE COMPLETE	1.4871**	0.2823	2.09	0.037
22. NC 10TH GRADE COMPLETE	1.5156**	0.2926	2.15	0.031
30. NC DIPLOMA... LEVEL 3	1.7564***	0.3708	2.67	0.008
34. 1ST DEGREE... LEVEL 4	1.6190**	0.3338	2.34	0.019
Constant	25.1285***	4.8958	16.55	0
Model Diagnostics				
Observations	370			
LR χ^2 (24)	193.92			
Prob> χ^2	0			
Log Likelihood	-1655.56			

This output presents the results of a standard Poisson Regression modeling the relationship between being a Remittance Recipient and the Food Frequency Score (ffs), while including a comprehensive set of socioeconomic control variables. This model is estimated on the restricted subsample (N = 370) and serves as the Biased Benchmark. Its results are inherently susceptible to endogeneity bias because it fails to account for the potential reverse causality or confounding from unobserved factors, thereby likely inflating the estimated effect of remittances. The coefficients are reported as Incidence Rate Ratios (IRR), which indicate the proportional change in the Food Frequency Score's incidence rate.

The key finding from this biased benchmark is the association between remittance receipt and consumption consistency. The coefficient for the Remittance Recipient variable is estimated to be 1.0581 and is statistically significant at the 5% level (P = 0.048). Since a higher ffs indicates greater food frequency and better consumption consistency, an IRR greater than 1 suggests that remittance receipt is positively associated with food frequency. Specifically, the incidence rate of the Food Frequency Score is estimated to be about 5.8% higher for remittance recipients compared to non-recipients, holding all controls constant. This positive association is the biased benchmark estimate; it suggests that, before correcting for endogeneity, remittances appear to boost food consumption, but this effect is likely capturing a mix of true causal impact and positive selection bias.

The control variables also highlight important determinants of food frequency. Household Size is highly significant and positively associated with ffs (IRR = 1.0195, P < 0.001), indicating that larger households tend to have a slightly higher food frequency score, perhaps due to economies of scale in cooking or purchasing. Conversely, the Head Age and Shock Indicator are not statistically significant in this model, suggesting that these factors, unlike in the Coping Strategy Index model, do not independently predict the frequency of food consumption when controlling for remittance status and education. Head Education is generally positively associated with ffs, as many education levels have IRRs significantly above 1, indicating that higher education often leads to higher food frequency and better consumption habits.

In summary, this Poisson regression confirms a statistically significant, positive association between receiving remittances and a higher Food Frequency Score. However, the true, unbiased causal effect is expected to be smaller or potentially different once the endogeneity bias, which is present in this benchmark model, is addressed using instrumental variables methods.

Discussion of Results

The primary goal of this study was to establish the causal impact of remittance receipt on various dimensions of household food security by rigorously controlling for endogeneity using the Instrumental Variable (IV) approach, thus addressing methodological gaps in prior literature.

The necessity and validity of the IV methodology were strongly confirmed. The IV Poisson Control Function (PCF) formally rejected the null hypothesis of exogeneity ($P = 0.018$), validating the choice of IV over biased conventional models. Crucially, the First-Stage F-statistic for the instrument (*neighbor remit*) was 53.47, which significantly exceeds the critical threshold of 10. This result confirms the instrument's strength and ensures that the causal estimates are not undermined by weak instrument bias (Moniruzzaman, 2022).

Causal Impact on Food Consumption Expenditure (FCE)

The IV estimation revealed a statistically significant and positive causal impact of remittance receipt on Household Food Consumption Expenditure (FCE). This finding strongly supports the notion that remittances function as a vital external income shock absorber, immediately boosting a household's disposable income and, consequently, its economic access to food (Ajefu&Ogebe, 2021; World Bank, 2024). The increase in FCE confirms that the transfers are successfully channeled into consumption smoothing, a key goal of household migration decisions under the New Economics of Labor Migration (NELM) framework (Stark, 1991). This result is consistent with recent findings that highlight the primary use of remittances for essential household needs, with food typically being the largest share (Sulemana et al., 2019).

Causal Impact on Dietary Diversity Score (DDS)

The analysis of the Household Dietary Diversity Score (DDS), which measures food utilization and quality, provided a critical insight into the qualitative impact of transfers. The IV PCF model revealed a highly significant positive causal effect of remittance receipt on DDS ($P = 0.003$). The estimated Incidence Rate Ratio (IRR) of 1.042 indicates that receiving remittances is causally associated with a 4.2% increase in the rate of dietary diversity.

This finding aligns with modern studies that use IV to establish causality between remittances and improved diet quality (Moniruzza man, 2022). The flexibility of cash transfers, as opposed to in-kind aid, allows recipient households to respond to local market prices and preferences, efficiently translating income into a wider variety of food groups—such as fruits, vegetables, and protein—which are essential for long-term nutritional security (Mora-Rivera & van Gameren, 2021).

Causal Impact on the Coping Strategy Index (CSI)

The CSI analysis, which measures reliance on negative coping mechanisms, provides evidence on household resilience. The benchmark Poisson model indicated a strong inverse relationship, with an estimated Incidence Rate Ratio (IRR) of 0.5258 ($P < 0.001$). Since a lower CSI score indicates better food security, this demonstrates that remittances significantly reduce the frequency and severity of adverse coping strategies.

This confirms the robust protective role of remittances as an immediate, private safety net (Abadi Mistru, 2014; World Bank, 2024). By augmenting household finances, remittances prevent the depletion of productive assets (e.g., selling livestock) and the adoption of harmful consumption-based coping strategies (e.g., reducing meal portions), thereby bolstering the household's resilience against internal and external shocks (Chamdimba et al., 2021). The significant positive effect of the Shocks variable in the models further underscores the necessity of this remittance-based insurance mechanism. The empirical findings are consistent across all three food security dimensions—economic access (FCE), utilization (DDS), and vulnerability (CSI)—validating the overall conclusion that remittances are a significant, positive, and causal determinant of improved household food security in the Tigray region.

Chapter Five

Conclusion and Recommendation

5. Introduction

This is the last chapter that consists of the main part of the research which consists of conclusion and recommendation. The study examined the impact of food and cash remittances in relation to household food insecurity. In this regard, the overall solution of the study that implies the role of the nearby society, leaders, local administrative and the policy makers is briefly explained.

5.1 Conclusion

This study is exploring the impact of food and cash remittances on household food insecurity focusing on how different types of remittances contribute in improving food access. Thus, the impact of food and cash remittances on food insecurity is possible to frame it the protective and stabilized effect on household food access inline to consumption. Remittances are funds transferred from migrants to their home country. The result highlight the importance of remittances flows as informal especially in low income or crisis damaged society.

Cash remittances are particularly effective in enhancing purchasing power allowing households to diversify their food intake and better cope with food price volatility. In contrast, food remittances provide a more direct form of support ensuring that basic nutritional needs are met, particularly in rural or remote areas where market access may be limited. In all sides, remittances can significantly alleviate food insecurity by providing additional financial resources which can improve access to stability in household income and contributes better food security. Strengthening channels for safe and reliable transfer both cash as well as in kind could aid households against food insecurity.

Though it is not advisable to migrate from the origin country, the remittances from family members living abroad play a significant role in the country's economy, providing financial support to families and contributing to the national economy beyond a source of foreign exchange. Therefore, the migration and remittances are deeply linked to the socio political and economic situation of the people as mentioned above. The remittances are mostly informal due to week banking access, especially in Tigrai region.

Among the respondents with known educational levels, a large proportion of household heads have attained only primary-level education. For example, the most frequently reported specific education

level is "NC 10th Grade Complete" (6.01%), followed by "8th Grade Complete" (5.41%) and "3rd Grade Complete" (4.50%). These figures suggest that the educational attainment of household heads tends to concentrate at the lower levels of formal education, particularly up to the end of primary or early secondary schooling.

In summary, the educational profile of household heads in the Tigray region appears to be concentrated at lower levels of attainment, with limited representation of tertiary or technical education. The dominance of "Don't Know" responses significantly restricts the ability to draw more definitive conclusions, but the data nonetheless suggest that education, as a structural factor, may play a modest but meaningful role in shaping household food security and remittance reception. The rural majority in the sample further underscores the relevance of rural development and education access policies in addressing food insecurity in the region.

The descriptive statistics illustrate a considerable variation in both remittance receipt and food security outcomes among households in the Tigray region. The large standard deviations and wide ranges, particularly in expenditure and remittance variables, underscore the heterogeneity of household economic conditions. This variation provides a meaningful basis for further analysis on how different forms and levels of remittances may influence household responses to food insecurity.

Overall, this paper analysis provides valuable insights into the complex factors shaping household food consumption in the Tigray region. The findings inform to design more effective and equitable food and nutrition security policies and programs in the region. Implementing these recommendations can help mitigate the effect of food insecurity in households reliant on remittance, ultimately leading to more resilient communities. To generalize the impact of the cash and in-kind remittances, they are really contributing to different measures of food security such as, coping strategy index; reduced coping strategies index, household food insecurity and access scale food consumption score in Tigray based on household survey data collected by the Ethiopia-economic survey. Therefore, we should take into account the role played by remittance transfers in addressing food insecurity.

5.2 Recommendations

This paper needs to show the impact of cash and food remittances on household's food security status besides enhancing the society. Therefore, the stockholders, the governors (leaders) and other developmental agencies are in need of giving focus and address the ultimate point that aids the people in practice improved life of the household.

Thus, the households themselves should use the remittances wisely when it is needy which one factor to own the food access is. In addition, develop the saving habit, and plan to invest at a small scale. The findings highlight the multidimensional nature of food security, with gender, household structure, human capital, and food environment all playing crucial roles. Potential interventions could include targeted social protection programs, investments in rural infrastructure and markets, women's empowerment initiatives, and educational campaigns on nutrition and food management should be practiced.

The leaders also should implement policies to facilitate safer, more affordable and faster remittance transfer.. As a result they could not look the receivers only but also could consider the senders, welfare since both of them are the main actors of the remittances activity, finally consider the following points in detail;

Facilitate a safe transfer of remittances; in order to get the affordable income from the migrants the government and other financial institutions should ensure flow channel for both (cash & in kind). Here also, it is vital reducing transfer cost especially for the low income people of the rural so as to increase the received item.

Uplift Migrants those send remittances; since the senders of remittances affect household food insecurity, protection and support in their earnings and rights of is important in legal pathway in relation to the labor wage.

Recognize the role of in-kind remittances; while cash is often prioritized in every aspect, the in-kind remittances play a vital role in supporting food security. For instance, in market access limited time and area this in-kind remittance is very important.

Promote food system resilience; the areas that rely on food remittance the government and policy makers and other development agencies should invest/put a direction in local food system, aware the saving practices and integrate remittances in to social protection systems.

Promoting financial literacy: Encourage recipients to use remittances wisely through financial education and training to ensure long-term food security. This can help the people to plan well how

manage the small remittance in appropriate way and maintain a sufficient food to the household. It is clear that the people is active to adapt such important agenda and is simple to train as a town.

Investment in productive assets: Advising recipients to invest remittances in a productive asset in independently owned enterprises such as small businesses which can run with fewer employees and generate lower revenue. Some examples can be local restaurants, boutique, shops etc.

Lastly policy makers could address the positive impact of remittances that makes it imperative to include migration and remittances as important components of food security programs. Food security policies should go beyond just food production measures, and include measures that help in generating adequate levels of effective demand via income growth or transfers policies. In addition;

Policy support: Advocating for policies that facilitate the flow of remittances reduce transaction costs and maximize their positive impact on food security. Those can be some alternatives to practice so as to have enough food in household.

Do a research; the specific food security challenges in the region including economic, environmental and social factors

Collect data and case study; that illustrate the importance of food security besides the impact of current policies.

Propose sustainable solution recommended; evidence-based strategies that address food security like, supporting local agriculture and sustainable farming practices, enhances access to markets for smallholder farmers, investing in infrastructure to reduce food lose and promoting nutrition education and food diversity.

Overall, these recommendations aim to improve the effectiveness of remittance flow in combating food insecurity while addressing structural issues in the remittance process and local economies. A multi faced approach that combines policy reforms, local development initiatives and migrant welfare support will be crucial for strengthening food security via remittances in the long term.

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Appendix