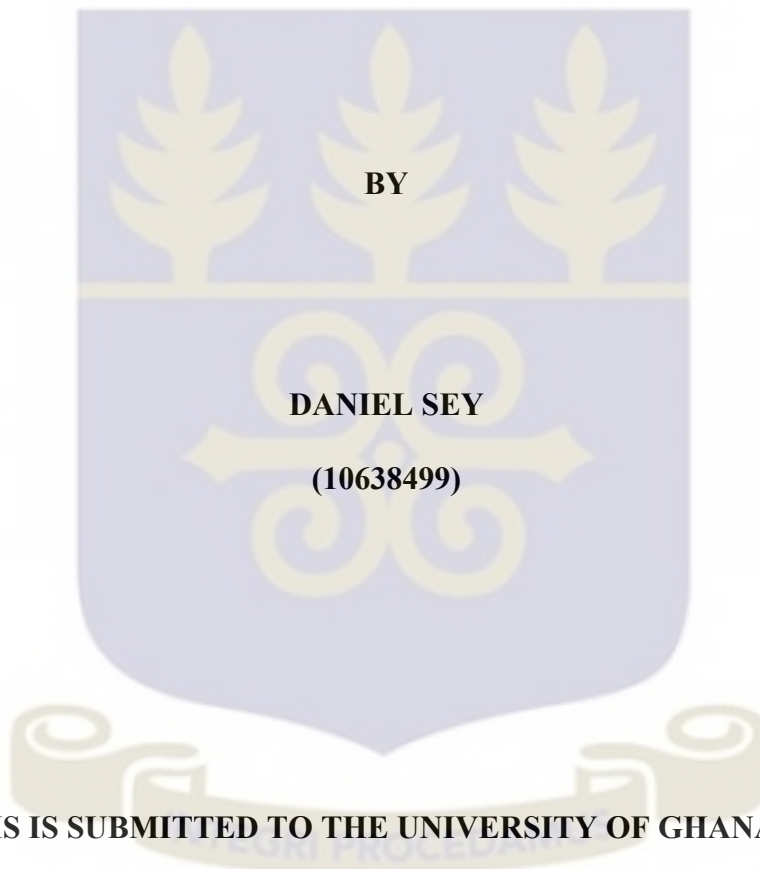


**UNIVERSITY OF GHANA  
COLLEGE OF HUMANITIES**

**THE IMPACT OF REMITTANCE RECEIPTS ON AGRICULTURAL ASSET  
ACCUMULATION: EVIDENCE FROM GHANA**



**BY**

**DANIEL SEY**

**(10638499)**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MPhil  
ECONOMICS DEGREE**

**DEPARTMENT OF ECONOMICS**

**JULY 2019**

## DECLARATION

This is to certify that this thesis is the result of research undertaken by **DANIEL SEY** towards the award of the Master of Philosophy (MPhil) degree in the Department of Economics, University of Ghana and that no part of it has been presented for another degree in this university or elsewhere.



29<sup>th</sup> June 2020

.....  
DANIEL SEY

.....  
DATE

**(10638499)**

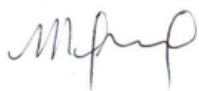


29<sup>th</sup> June 2020

.....  
DR. LOUIS BOAKYE-YIADOM

.....  
DATE

**(SUPERVISOR)**



1<sup>st</sup> July 2020

.....  
DR. MONICA PUOMA LAMBON-QUAYEFIO

.....  
DATE

**(SUPERVISOR)**

## ABSTRACT

In the remittance literature, the empirical relationship between remittance receipts and agricultural asset accumulation has not been fully explored, and no clear-cut findings have been established. This is even worse for the sub-Saharan region and particularly for Ghana where little or no studies have examined such connection. Most of the efforts are geared towards Latin America and the Caribbean (LAC), and Asian countries. The purpose of this study, therefore, is to explore the impact that remittance receipts have on the household accumulation of agricultural assets in Ghana. Using data from the sixth round of the Ghana Living Standards Survey, the study controls for selectivity bias inherent in remittance receipts by employing treatment effect estimators to investigate the connection between remittance receipts and asset accumulation. In addition to this, the study examines the factors influencing household asset ownership by using a Probit model. In the analysis of asset ownership, with the exception of household income, which significantly influences only the accumulation of farmland, all other variables significantly influence the household ownership of agricultural assets. Further, the results also suggest that the receipts of only international remittances significantly affect the household accumulation of farmland and livestock but not agricultural equipment. Thus, the receipts of only international remittances increase the household accumulation of farmland and livestock. However, the receipts of overall remittance (both international and domestic remittances) and the receipts of only domestic remittances do not increase the household accumulation of any form of agricultural asset.

**Keywords:** Remittances, Treatment Effect Model, Agricultural Assets

## **DEDICATION**

To my mother, Madam Comfort Adua Adams, who has been everything to me.

## ACKNOWLEDGEMENT

Coming this far with my formal education has been by the collective effort of so many people for which I am very grateful to God. I would like to express my deepest appreciation and gratitude to all and sundry that made it possible for me to complete this study.

I would want to humbly express my profound gratitude to my supervisors, Dr. Louis Boakye-Yiandom and Dr. Monica Puoma Lambon-Quayefio for their insightful criticisms and suggestions, patience to listen even at odd times, and dedication in helping me produce this thesis. I would also want to acknowledge with gratitude the assistance of Dr. Louis Boakye-Yiandom for his help in shaping the topic for this thesis. Most especially, I would want to thank Dr. Monica Puoma Lambon-Quayefio for the advice, concerns, and suggestions that were outside the domain of my thesis.

I would also like to thank every member of my family especially my sisters Mrs. Felicia Kudese and Mrs. Patience Odotei-Odoi who have been my backbone and support system throughout my education. Not forgetting Mr. Kwabena Osei-Ababio and Miss Yahan Adjoa Prah for their relentless efforts in helping me come this far and also to Mr. Derrick Yullie for his continual support and encouragement.

Finally, my profound gratitude goes to Mr. Felix Larry Essilfie for his selfless effort in helping immensely with my data management hurdles and supporting with his articles, my heartfelt gratitude. To Miss Josephine Baako-Amponsah, for proofreading a portion of my chapters, Mr. Osei-Brefu, for his assistance on my data management, and to Mr. Mawuli Kofi Tay, for editing the final draft of my thesis, I say God bless you all. To all my friends not mentioned here, your efforts in diverse ways towards the success of this thesis are well appreciated.

## TABLE OF CONTENTS

DECLARATION .....	ii
ABSTRACT.....	iii
DEDICATION.....	iv
ACKNOWLEDGEMENT .....	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES .....	x
LIST OF TABLES.....	xi
LIST OF ABBREVIATIONS.....	xiii
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.1 Background of the study .....	1
1.2 Statement of the Problem.....	4
1.3 Objectives of the study.....	7
1.4 Research Questions .....	8
1.5 Significance of the study.....	8
1.6 Scope of the study.....	9
1.7 Organization of the Study .....	10
CHAPTER TWO .....	11
GENERAL OVERVIEW OF REMITTANCES AND AGRICULTURE IN GHANA.....	11
2.1 Introduction.....	11
2.2 Overview of Remittances.....	11
2.3 Overview of Agriculture in Ghana .....	20

2.4 Summary .....	25
CHAPTER THREE .....	27
LITERATURE REVIEW .....	27
3.1 Introduction.....	27
3.2 The Concept of Remittances .....	27
3.3 Theoretical Literature Review .....	28
3.3.1 Motives for Sending Remittance .....	28
3.3.2 Remittance transfer channels .....	31
3.3.3 The cost of transferring remittances .....	33
3.3.4 Determinants of Remittance Flows.....	34
3.3.5 The Developmental Impact of Remittances.....	37
3.4 Empirical Literature Review .....	41
3.4.1 Determinants of the Ownership of Agricultural Assets in Ghana .....	41
3.4.2 Remittance and Agricultural Asset Accumulation .....	43
3.4.3 Studies on remittances in Ghana.....	51
3.5 Summary .....	53
CHAPTER FOUR.....	55
METHODOLOGY .....	55
4.1 Introduction.....	55
4.2 Main research questions.....	55
4.3 Potential-outcome framework.....	57
4.3.1 Assumptions underlying the Potential-Outcome Framework.....	59
4.4 The Probit Model-Ownership of Agricultural Assets.....	61
4.5 Analytical framework .....	63

4.5.1 Treatment Effect Model - Impact Analysis .....	64
4.5.2 Estimating Average Causal Effects .....	67
4.5.3. Estimation Procedure .....	68
4.6 Regression Diagnostics and Post-Estimation Tests .....	70
4.7 Descriptive and summary statistics of variables .....	70
4.7.1 The variables .....	70
4.7.2 Dependent Variables .....	73
4.7.3 Explanatory variables.....	74
4.8 Source of Data.....	77
4.9 Summary .....	79
CHAPTER FIVE .....	80
RESULTS AND DISCUSSIONS.....	80
5.1 Introduction.....	80
5.2 Descriptive statistics .....	80
5.3 Factors influencing the household ownership of agricultural asset.....	81
5.4 The Impact of Remittance Receipts on Agricultural Asset Accumulation.....	89
5.4.1 The Impact of the Receipts of both International and Domestic Remittance (Overall remittance) on Agricultural Assets .....	89
5.4.2 The Impact of the Receipts of Only International Remittance on Agricultural Assets .....	92
5.4.3 The Impact of the Receipts of Only Domestic Remittance on Agricultural Assets.....	96
5.5 Testing for overlap plots and balancing of covariates .....	99

CHAPTER SIX.....	101
SUMMARY, CONCLUSION AND POLICY RECOMMENDATION .....	101
6.1 Introduction.....	101
6.2 Major findings of the study.....	101
6.3 Conclusion .....	103
6.4 Policy recommendation .....	104
6.5 Limitations of the study .....	106
6.6 Suggestions for Future Studies .....	106
REFERENCES .....	107
APPENDIX.....	119

## LIST OF FIGURES

Figure 2.1: Household receipts of remittance .....	13
Figure 2.2: Origin of household remittance .....	14
Figure 2.3: Channel of remittances flow.....	15
Figure 2.4: Sex of household member sending remittances .....	16
Figure 2.5: Relationship of remitter to household head (N=8,965).....	19
Figure A1: An overlap plot for the receipts of overall remittance.....	130
Figure A2: An overlap plot for the receipts of only domestic remittance .....	130
Figure A3: An overlap plot for the receipts of only International remittance .....	131

## LIST OF TABLES

Table 2.1: Receipts of remittance by household.....	17
Table 2.2: Remitters location (%) by sex of the remitter.....	17
Table 2.3: Channel of remittance flow (%) by sex of the remitter .....	18
Table 2.4: Ownership of Agricultural Assets (%) by the Household .....	22
Table 2.5: Farmland status (%) by sex and location of the household head.....	23
Table 2.6: Livestock status (%) by sex and location of the household head .....	24
Table 2.7: Agricultural equipment status (%) by sex and location of the household head.....	25
Table 4.1: Means and Standard deviation of variables .....	72
Table 5.1: Household Asset Ownership for remittance recipients only .....	80
Table 5.2: Household Asset Ownership for remittance non-recipients only .....	81
Table 5.3: A Probit model for the ownership of agricultural assets .....	87
Table 5.4: Receipts of overall remittance on farmland.....	89
Table 5.5: Receipts of overall remittance on livestock holding.....	90
Table 5.6: Receipts of overall remittance on agricultural equipment.....	91
Table 5.7: Receipts of only international remittance on farmland.....	92
Table 5.8: Receipts of only international remittance on livestock holding .....	93
Table 5.9: Receipts of only international remittance on agricultural equipment.....	95
Table 5.10: Receipts of only domestic remittance on farmland .....	96
Table 5.11: Receipts of only domestic remittance on livestock holding .....	97
Table 5.12: Receipts of only domestic remittance on agricultural equipment .....	99
Table A1: Determinants of remittance receipts in Ghana.....	119
Table A2: Recipient (Farmland_1) and non-recipient (Farmland_0) farmland regressions together with first stage probit regression.....	121

Table A3: Recipient (Livestock_1) and non-recipient (Livestock_0) livestock holding regressions together with first stage probit regression.....	123
Table A4: Recipient (Equipment_1) and non-recipient (Equipment_0) agricultural equipment regressions together with first stage probit regression.....	125
Table A5: The impact of remittance receipts on the accumulation of farmland .....	127
Table A6: The impact of remittance receipts on the households' holdings of livestock.....	127
Table A7: The impact of remittance receipts on the accumulation of agricultural equipment .....	127
Table A8: Linktest for livestock ownership.....	127
Table A9: Linktest for agricultural equipment ownership.....	128
Table A10: Linktest for farmland ownership.....	128
Table A11: Relationship of the remitter to household head .....	128
Table A12: Unadjusted pre-participation characteristics of overall remittance recipients and non-remittance recipients.....	129
Table A13: Weighted pre-participation characteristics of overall remittance recipients and non-remittance recipients. ....	129

## LIST OF ABBREVIATIONS

GSS	Ghana Statistical Service
MENA	Middle East and North Africa
LAC	Latin America and the Caribbean
GLSS	Ghana Living Standards Survey
GLSS 5	The 2005/2006 Ghana Living Standards Survey
GLSS 6	The 2012/2013 Ghana Living Standards Survey
GLSS 7	The 2016/2017 Ghana Living Standards Survey
GDP	Gross Domestic Product
FDI	Foreign Direct Investment
CIA	Central Intelligence Agency
MTOs	Money Transfers Organizations
WDI	World Development Indicators
BOP	Balance of Payment
GLS	Generalized Least Squares
OLS	Ordinary Least Squares
CDF	Cumulative Density Function
IV	Instrumental Variable
CI	Conditional Independence
I.I.D	Independence and Identically Distributed
SUTVA	Stable Unit Treatment Value
IPW	Inverse Probability Weighting
IPWRA	Inverse-Probability-Weighting with Regression Adjustment
AIPW	Augmented-Inverse-Probability-Weighting
PSM	Propensity Score Matching
ATE	Average Treatment Effect
ATET	Average Treatment Effect on the Treated
DR	Doubly Robust
TLA	Total Land Area
ALA	Agricultural Land Area

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the study

Approximately 180 million people from developing countries reside in countries other than their home country according to the World Bank (2016). This constitutes about 3.1 percent of the developing countries' population. Remittances from these individuals have become the principal source of income for their development (Gonzalez-Velosa, 2011). Because of this, numerous studies have sought to examine the developmental effects of remittance on diverse outcomes. Studies exploring the remittance phenomenon have increased significantly, and at the same time, a considerable number of these studies rely on remittance from migrants.

Given that remittances are usually sent by migrants, most studies have therefore narrowed the analyses of remittances to those sent by migrants for which they are called migrant remittances (see, for example, Adaawen & Owusu, 2013; Adams, 2011; Gonzalez-Velosa, 2011; Quartey et al., 2018; Salomone, 2006). Boakye-Yiadom (2008, p. 97-98) succinctly puts it that, "it should be noted though, that remittances are not necessarily sent by migrants, and that sometimes migrants are rather the recipients of these transfer. Furthermore, remittance transfer can occur outside the context of migration, even though such occurrences appear to be much less common". It is fair, however, to say that remittance transfers typically occur within the context of migration; in other words, remittance often takes the form of transfers from (or to) migrants (Boakye-Yiadom, 2008). Understanding that, although migration and remittance are closely linked together, it does not imply that remittances emanate solely from migration. In practice, there are transfers to the households that do not come from migrants. For instance, evidence from the Ghana Statistical Service (GSS, 2017) shows that 68 percent of migrants did

not send remittance during a period of 12 months in 2016 and 4.5 percent of remittances are recorded from non-relatives (GSS, 2012). Remittance studies in recent times have featured predominantly in the scientific discussion with regards to livelihood, welfare, and development in most emerging countries. This permeation is due to the huge volume of international transfer that many residents of developing countries receive (Boakye-Yiadom & Lambon-Quayefio, 2017). For instance, according to the World Bank (2016), remittances amounted to 42 percent of Gross Domestic Product (GDP) in Tajikistan, and they are larger than the revenue from the Suez Canal in the Arab Republic of Egypt and larger than the revenue from tourism in Nepal.

A more appropriate way to view remittance then is to see it as a broader part of the literature on private transfer. More formally, within a household livelihood framework, Boakye-Yiadom and Lambon-Quayefio (2017) saw remittances as a “monetary or in-kind” transfer from one household to another for which no explicit recompense is needed. According to Quartey (2006, p. 4), remittances are “financial flows into households that do not require a quid pro quo in economic value”. And as such, they are customarily seen as personal monetary relief that moves unswervingly into homes.

The flow of remittances both internally and internationally has gained global recognition due to its significant effects on social and economic outcomes, and development as a whole especially for developing regions of the world. According to Aggarwal, Demirgüç-Kunt, and Pería (2011), remittances flow have enormous potential for generating positive effects in the recipient country and has, over time, become extremely principal as the foundation for income and foreign exchange in various emerging countries. The flow of private income transfer to developing countries has been made much easier because of the global increase in migration, advancement in technologies and the competition among financial institutions has resulted in

a decline in the costs of transferring money. To Acosta (2006), this accounts for the increased flow of remittances and its positive effects on the economy.

The use to which remittances, in general, is put by the household depends on how the receiving household perceives the remittance (Randazzo & Piracha, 2014). The empirical literature establishes three views of how the household perceives remittances. Firstly, households that regard remittances as compensatory spend more at the margins of consumption rather than investment goods. Such incomes lessen the household budget constraints permitting them to increase their consumption of food, clothing and other basic necessities of life. Secondly, households that see remittances as any other form of income have no preference in the expenditure behavior and finally, households that view remittances as transitory income tend to spend more at the margin of productive activities. This latter view is from the permanent income hypothesis. Thus, households that receive remittances tend to invest in productive activities like acquiring assets, housing, building, and investing in the education of children. These productive investments made by the household improve their livelihood as well as subsistence needs thereby alleviating poverty. While some remittance studies have focused on the nexus between remittances and economic growth (Aggarwal, Demirgüç-Kunt, & Pería, 2011; Giuliano & Ruiz-Arranz, 2009; Özden & Schiff, 2006; Rahman, 2009), others also have focused on the role of remittances on poverty alleviation (Adams, 2006; Maimbo & Ratha, 2005), and on investment in education (Adams, 2011; Gyimah-Brempong and Asiedu, 2015; Adams, Cuecuecha, & Page, 2008; Boakye-Yadom & Lambon-Quayefio, 2017).

Interest in remittances and agricultural change has received increased attention in the past years and there has been a strand of literature dedicated to it. Much of the concentration is on developing economies like Latin America and the Caribbean (LAC), the Asian region, and the Middle East and North Africa (MENA) (Böhme, 2015; Chiodi et al., 2012; Damon, 2010; McCarthy et al., 2006). Even though these studies provided great insight into the role of remittances on agricultural outcomes, very few have sought to examine the impact of remittances on agricultural assets in sub-Saharan Africa, specifically in Ghana. Empirical evidence has shown that remittances positively impact on livestock holding, agricultural equipment, and agricultural land and farmland. To this end, the study seeks to examine the effects of receiving remittances on farmland, livestock holding, and agricultural equipment as a measure of agricultural asset in Ghana.

## **1.2 Statement of the Problem**

Remittance flows have numerous impacts on the recipient country and offer a higher relief for developing countries. Salomone (2006, p. 5) notes that “remittances have concentrated on developing countries” because of the increasing flow of remittances received by these countries. The flow of remittances helps to keep money and wire transfers companies in business hence creating employment and contributing to economic growth, facilitates poverty alleviation and income inequality, improves household welfare and livelihood, fosters economic growth and development, enables investment in education, helps improve and enhance agricultural production and productivity, and provides credit for investing and accumulating assets. In view of the above role played by remittances in most developing countries, it has received increasing attention in the sending home country (McCarthy, Davis, Carletto, & Maltoglou, 2016).

The literature regarding the motivation to remit was sparked by Lucas and Stark (1985) in their ground-breaking work, "Motivations to Remit: Evidence from Botswana". The remittances literature has therefore gathered evidence on four motives for sending remittances- those sent as a return to the investment made on a migrating family member (loan repayment motive), remittances sent out of concern for the well-being of the family members back home (altruism motive), remittances sent as hedges to financial hurdles or constraints (portfolio motive) and remittances that serve as a replacement for missing insurance markets (coinsurance motive).

Numerous studies have examined the loan repayment motive, the altruism motive and the coinsurance motive for sending remittances. Studies that concentrated on remittances sent as a return to an investment made on a migrating family member or labor-out and altruism include Lerman and Sutton, (2008), McCarthy et al. (2006), Miluka et al. (2007), Rozelle, Taylor, and deBrauw, (1999). Whiles those that serve as missing insurance markets include Amuedo-Dorantes and Pozo (2006), de la Brière, Sadoulet, de Janvry, and Lambert (2002), Stark and Lucas (1988).

The literature that is expressly concerned with the relationship between remittance and productive investments remain contested (Chiodi et al., 2012). Most research on the linkage concerning migration, remittances and asset accumulation has concentrated on Latin America and the Caribbean. Thus, Chiodi et al. (2012) observed that, in a set of financial markets' inadequacies, remittances could serve as an alternative to the limited access to credit and insurance provision to the household and as such yields positively on investment (Chiodi et al., 2012). Also, Bohme (2015) using an instrumental variable estimation technique to control for endogeneity present in migration observed a positive and significant connection or linkage between international migration and agricultural assets accrued over time but, however, found

a negative relationship between livestock capital. Still within the Latin America and Caribbean region, in a household level analysis, Damon (2010) examined the effect that intercontinental migration and remittance had on various dimensions of agriculture in El-Salvador using a panel data. Specifically, the examination was based on land use allocations, agricultural asset accumulation, and agricultural input use and returns. The study found that when it comes to the effect of remittance on agricultural assets accrued existing in land and livestock holding, a weak evidence exists.

Other studies also focused on Asia. Thus, Yang (2008, p. 625) in a study on the Philippines found that “large exogenous shocks to the income and wealth of Philippine migrant households, which manifest themselves in part via changes in remittances, have little consequences on household consumption but great effects on diverse forms of household investments”. This is contrary to previous studies in international migration where it was established that remittances are essentially meant for consumption purposes rather than been invested. Again, the empirical results from Adams Jr. (1998) showed that the accessibility and presence of remittance income increase investment in rural assets as it raises the marginal propensity to invest for migrant households. Specifically, the model results indicated that remittance income has no meaningful and positive consequence on the entire accumulation of diverse forms of a physical asset (Adams, Jr., 1998).

While it is generally accepted that remittances are sent home for a variety of reasons, the portfolio motive, asset accumulation, and investment, for sending remittances have been thoroughly investigated in most Latin America and Asia countries. That is, the majority of studies have concentrated on these areas. However, the sub-Saharan Africa region has not been largely examined. There is limited literature in examining the impact of remittance receipts on

agricultural asset accumulation in the region. Lucas (1987) found that remittances sent by emigrants working in the mines of South Africa are more likely to acquire livestock in the long-run. Again, in Burkina Faso, Wouterse and Taylor (2008) in their study established that remittances from inter-continental migration, which tends to be long-term stimulate livestock production and accumulation although adversely affects staple and nonfarm activities (Wouterse & Taylor, 2008). A cross-sectional study by Gubert (2002) of Western Mali found no impact of remittances on the investment of productive assets.

In Ghana, much studies have not examined the remittance asset accumulation relationships. There is, therefore, a paucity of research on such relationships. Thus, little or no research has been conducted on the impact of remittance receipts on agricultural asset accumulation. It is in view of the above that the study seeks to investigate the impacts that remittance receipts have on agricultural asset accumulation in Ghana.

### **1.3 Objectives of the study**

The main objective of this study is to investigate the impact that remittance receipts have on the accumulation of agricultural assets in Ghana.

Specifically, this research seeks to:

1. Identify the factors influencing the household ownership of agricultural assets in Ghana.
2. Examine the extent to which remittance receipts affect the household accumulation of farmland.
3. Assess the influence that remittance receipts have on household livestock holding.
4. Investigate the impact of remittance receipts on the household accumulation of agricultural equipment.

#### **1.4 Research Questions**

1. What are the factors influencing the ownership of agricultural asset in Ghana?
2. What impact does remittance receipts have on the accumulation of farmland?
3. What impact does remittance receipts have on household livestock holding?
4. What is the impact of remittance receipts on the household accumulation of agricultural equipment?

#### **1.5 Significance of the study**

The study of the impact of remittance receipts on agricultural asset accumulation in Ghana has much significance. Agricultural assets, in general, are made up of the total number of agricultural lands and farmland, livestock holding and the equipment used for agricultural activities. These assets complementarily aid in food production and livestock rearing through which a large number of people are employed. Because these assets are extremely vital for agricultural sector growth and economic development coupled with the fact that remittances to the Ghanaian economy are larger than the amount of ODA in the year 2017. There is a need to examine how remittances accelerate agricultural sector growth through asset accumulation. There have, however, been relatively little or no studies on the impact remittances have on the agricultural sector-particularly the accumulation of agricultural assets. The need for such a study is expedient because understanding that remittances aid households in the acquisition of assets will boost development in the agricultural sector, and subsequently economic growth. This then will serve as an avenue for authorities to make policies that will affect the flow of remittances to the country and how that can affect agricultural development.

Again, this study is significant because, as a whole, it will contribute to the body of knowledge in this area of study. This is because numerous studies that have examined the effect of remittance on various agricultural outcomes aimed attention at most Latin America and Asian countries, therefore a study on Ghana will add to the literature in this regard. Most importantly, in contrast to previous studies, this study employs more robust empirical estimators in estimating the relationship between remittances and agricultural asset accumulation.

### **1.6 Scope of the study**

The rationale for undertaking this study is to examine the remittance and asset accumulation relationships. Specifically, by assessing the impact of remittance receipts on farmland, livestock holding, and agricultural equipment. This research seeks to unearth the degree to which remittance receipts amongst other factors have contributed to the accumulation of agricultural assets by first identifying the counterfactual. That is, what would have been the case if no households had received remittances compared to those who receive remittances. This therefore relies on a counterfactual framework. In impact evaluation studies, several methods or approaches are used in identifying the effect of the treatment variable on the outcome variable. These include randomization, propensity score matching, double difference, instrumental variable, and the pipeline method. This study makes use of treatment effect model because of selectivity problem inherent in observational studies. Two estimators of treatment effect model, inverse-probability-weighting with regression adjustment (IPW-RA) and propensity score matching (PSM), are used for the impact evaluation analysis. This technique is deemed appropriate because it develops a counterfactual or control group similar to the treatment level as possible in terms of observed characteristics. The analysis of this study is done using the data from the sixth round of the Ghana Living Standards Survey (GLSS-6) and carried out using Stata 15 and Microsoft Excel for graphs and charts where necessary.

### **1.7 Organization of the Study**

The study is organized into six chapters. Chapter one consists of general introduction of the study. The subsequent chapter considers a general overview of remittance and agriculture in Ghana. The third chapter reviews the relevant literature (both theoretical and empirical) that underlies the connection between remittance and agricultural asset accumulation. The fourth chapter takes into account the methods, data, and procedures for the empirical analysis. Presentation and discussion of results are done concerning the literature in chapter five. Chapter six presents the summary, conclusions, policy recommendations and the limitations of the study.

## CHAPTER TWO

### GENERAL OVERVIEW OF REMITTANCES AND AGRICULTURE IN GHANA

#### 2.1 Introduction

The general objective of this chapter is to provide an overview of remittance inflow and agricultural asset in Ghana. The aspects of agricultural asset considered for this study include farmland, livestock holding, and agricultural equipment. The main outline of this chapter focuses on the characteristic of global remittances, remittances in Ghana and the accumulation of agricultural assets. This overview of Ghana's remittance flow makes use of data from GLSS 5 and GLSS 6 and in some cases, a reliance on the GLSS 7 dataset. This section will make use of tabular and graphical approaches where and when necessary.

#### 2.2 Overview of Remittances

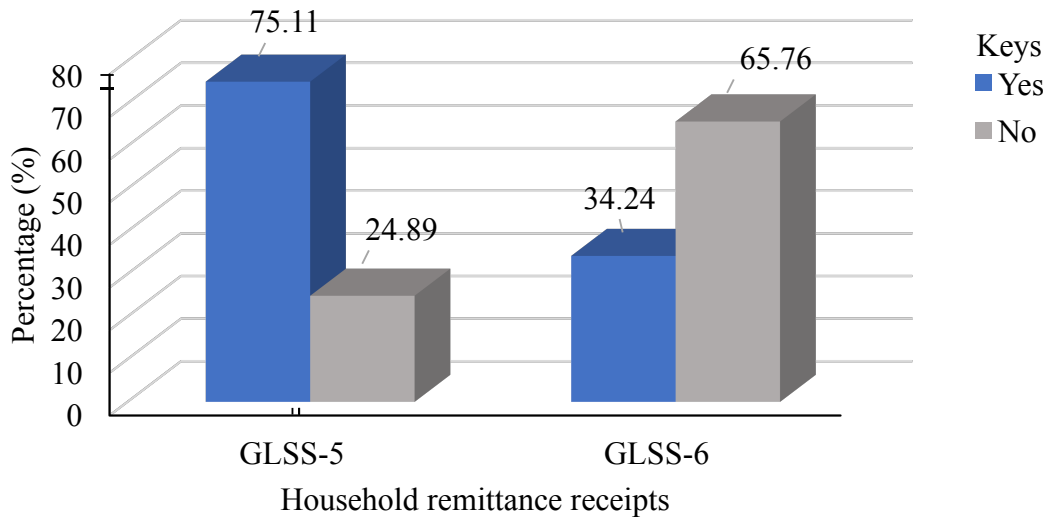
Cox and Rank (1992) defined remittances as private inter-vivos transfers. Similarly, Chami, Fullenkamp, and Gapen, (2008) saw remittances as private income transfers from a relative living and working overseas to an existing family member in their home country. Many studies have assessed the poverty ameliorating effects of remittances. This is because remittances enable the recipient households to improve upon their welfare by increasing consumption, thereby overcoming certain economic difficulties (Buch, Kuckulenz & Le-Manhec, 2002; Ratha & Shaw, 2007). According to Guillano and Ruiz-Arranz, (2008) remittance flow is ranked behind foreign direct investment (FDI) as a source of external funding for development in developing countries. Aggarwal et al. (2011) also affirmed the above assertion. They indicated that remittances inflow is twice as large as the amount of official development assistance (ODA), both in absolute and relative terms as a proportion of GDP. World Bank

(2016) indicates that officially recorded remittance inflows were estimated to have exceeded \$601 billion in 2015, much higher than total official development assistance and private non-foreign direct investment (FDI) flows.

In Ghana, the period before the 1960s was characterized by domestic migration (Awumbila & Ardayfio-Schandorf, 2008). Around that period, migration was characterized by the rich who traveled for educational opportunities. The rich who migrated sent remittances to family members who relied on these for livelihood. Remittances thus emerged as migration increasingly sprung up as a source of livelihood for most households in Ghana (Ganyo, 2013). In the 1970s, migration increased tremendously as many Ghanaians moved to Nigeria due to their discovery of oil. This resulted in high levels of remittances back home to Ghana (Akyeampong, 2010). According to Mensah-Bonsu (2003), migration in Ghana is usually from rural to urban areas, from the northern part to the southern part of the country. Such migrated individuals engage in economic activities with the purpose of sending money to family members left behind. The remittances sent by these migrants' in the form of money and goods are used for consumption and investment purposes. Put differently, due to the incidence of poverty, lag in development and reduced agricultural productivity, many households in the northern part of Ghana perceive migration as an investment from which return would be reaped through remittances (Kwankye, 2012). The migration of the youth from the rural areas to the urban centers coupled with the flow of remittances plays an essential role in providing income for the rural household to invest in agriculture. This, therefore, underscores the importance of internal remittances to the Ghanaian economy. Although remittance flow to Ghana uses unofficial channels, it was reported that remittance flows contributed about 7.4 percent to the GDP of Ghana (World Bank, 2018). Internally, quite a number of remittance transactions are also unrecorded. Nonetheless, remittances provide income to the family thereby subsidizing

the household expenditure, safeguard against shocks and disasters and help to reduce poverty. In Ghana, household level data on remittances and income transfer are seen in the Ghana Living Standards Survey (GLSS). These include among other things, the relationship between the migrant and the household head, the sex of the remitter, whether or not the remittance will be repaid, the various mediums through which the remittance was sent, and the geographical location of the remitter. In the case of Ghana, the overview of remittance will make use of both waves 5 and 6 of the GLSS to examine the overview of remittance to the country.

**Figure 2.1: Household receipts of remittance**

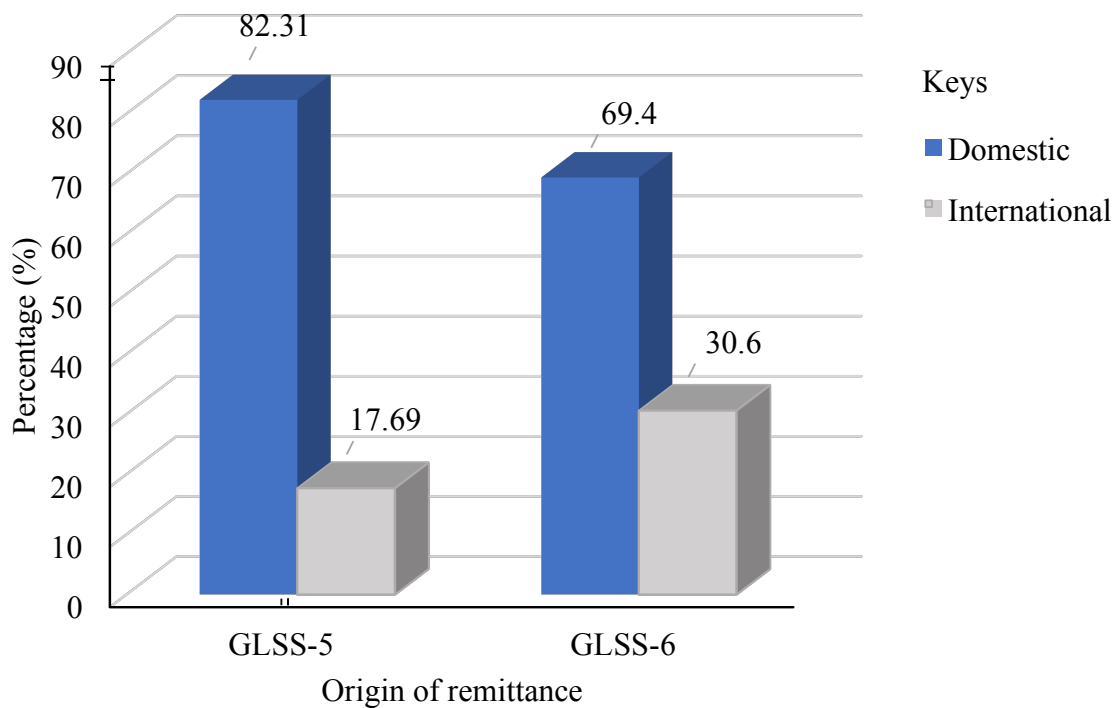


**Source: Author’s construct from GLSS 5 and GLSS 6 data**

Figure 2.1 shows the household remittance receiving status across wave 5 and 6 of the GLSS. In wave 5 of the GLSS, households received more remittances compared to households in wave 6 of the GLSS. Thus, approximately 75 percent of households responded to receiving remittances as against the 25 percent of households that did not receive remittances. While 75 percent of households received remittances in GLSS 5, in GLSS 6, the percentage of households that receive remittances declined, about 34.24 percent. With regards to households that did not receive remittances, about 66 percent of households from GLSS 6 indicated that

they did not receive remittances compared to the 25 percent of households that did not receive in the GLSS 5. The implication of the above is that, while the household receipt of remittances significantly increased in GLSS 5, the receipts of remittance in the GLSS 6 declined sharply. That is, from 75 to 34 percent. However, estimates from the Ghana Statistical Service (GSS, 2017) indicate that the household receipt of remittances increased to 35.10 percent.

**Figure 2.2: Origin of household remittance**

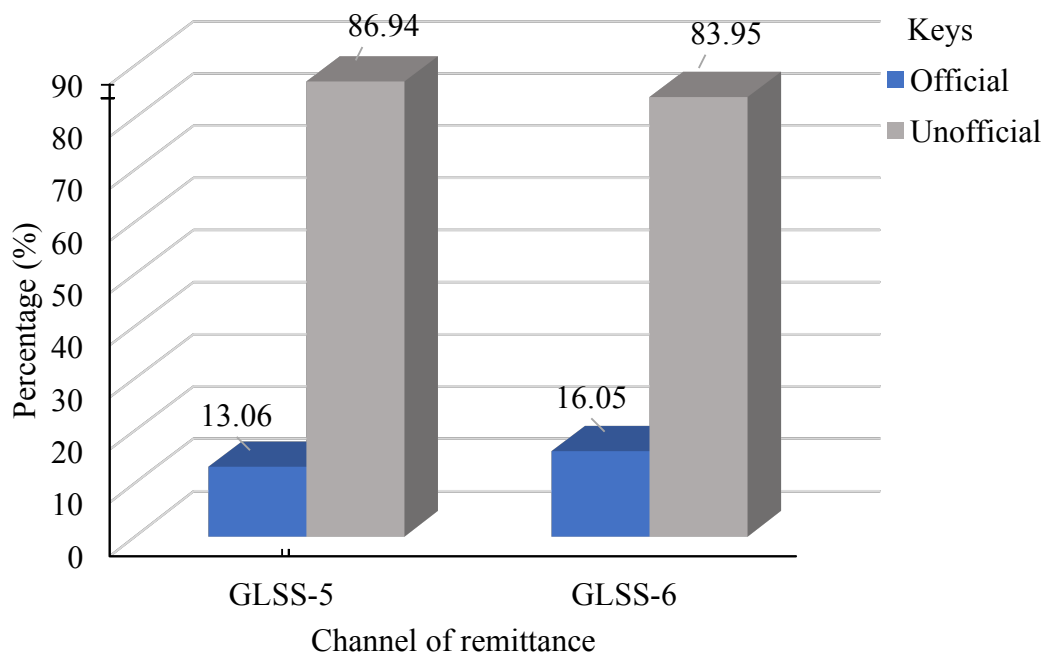


**Source: Author's construct from GLSS 5 and GLSS 6 data**

Figure 2.2 shows the origin from which remittance flows to the household across wave 5 and 6 of GLSS. The main sources through which the Ghanaian household receive remittances are through domestic and international sources. It is observed that remittance flows to the Ghanaian household are mostly domestic in nature or internally generated. Thus, the Ghanaian household receives more domestic remittances than international remittances. From GLSS 5, remittances received domestically was 82.31 percentage points compared to the 17.69 percentage points realized from international remittances. In the GLSS 6, however, the percentage of households

that receive domestic remittance declined from the near 83 percent observed in GLSS 5 to 69 percent with international remittances increasing marginally to 31 percent compared to the 18 percent realized in GLSS 5. The statistics illustrate that the percentage of households that receive domestic remittances has been increasing over time relative to international remittances.

**Figure 2.3: Channel of remittances flow**

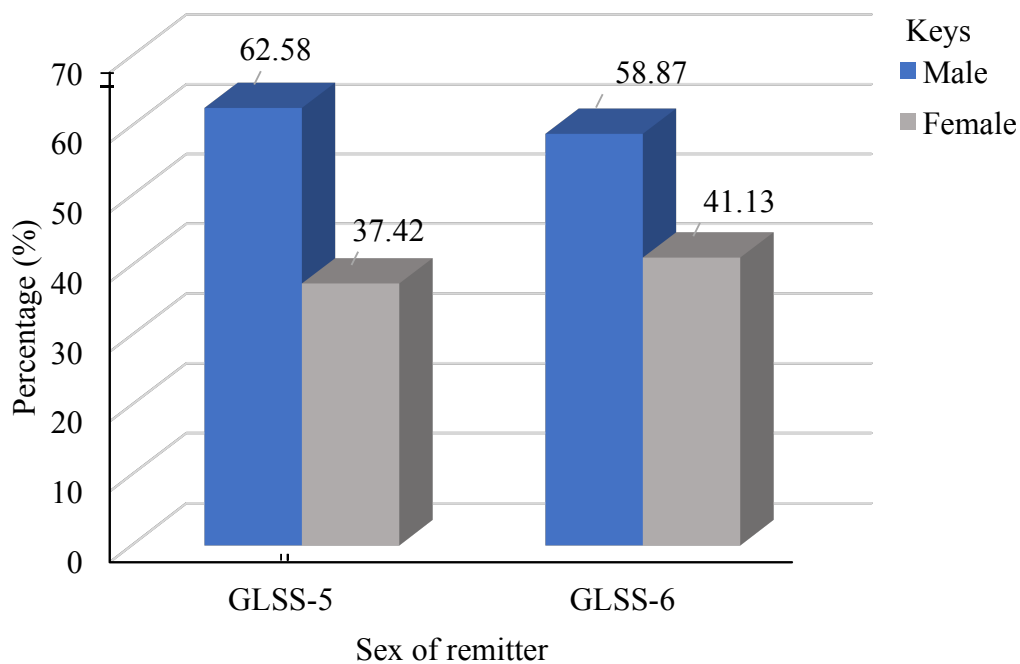


**Source: Author’s construct from GLSS 5 and GLSS 6 data**

The channel through which remittances flow has been largely examined. Generally, remittances flow through official and unofficial channels. The official channel requires the use of financial intermediaries such as banks, money transfer operators (Western Union and MoneyGram) and credit unions while unofficial channel involves the usage of courier-family members, acquaintances, and friends. Figure 2.3 shows that remittance flows to the Ghanaian household use the unofficial channel more than the official. From the table, waves 5 and 6 of the GLSS show that unofficial channels of remittance flows to the household was 86.94 percent and 83.95 percent respectively while the receipts of remittances from official channel

constituted about 13.06 percent and 16.05 percent respectively. The implication of the above is that; remittances flow through unrecorded channels. Thus, the flow of remittances through unofficial channel is on the rise due to the high cost associated with sending money to the household via official channels of remittance flows.

**Figure 2.4: Sex of household member sending remittances**



**Source: Author's construct from GLSS 5 and GLSS 6 data**

In Figure 2.4, the sex of the remitter across waves 5 and 6 of the GLSS is discussed. It is observed that more males live away from their home area than females and also more males are involved in sending remittances than females. While the percentage of males who send money to the household was 62.58 percent, the percentage of females remitting the household was 37.42 percent in GLSS 5. However, in the GLSS 6, the percentage of males remitting the household declined from the 62.58 percent observed in GLSS 5 to 58.87 percent in GLSS 6 with female remitters increasing, from 37.42 percent to 41.13 percent. This indicates that, within the Ghanaian remittance context, more males are associated with sending remittances than females since they engage more in-migration than females.

**Table 2.1: Receipts of remittance by household**

Household's remittance status	Frequency	Percentage
Received remittances	5,743	34.24
Did not receive remittance	11,029	65.76
Total	16,772	100

**Source: Author's construct from GLSS 6 data**

Table 2.1 presents the households remittance receiving status categorized into whether the household receives remittance or did not receive remittance. It can be seen from the table that, out of the 16,772 households, 5,743 households responded to having received remittances representing 34.24 percent. Households that did not receive remittances were 11,029 representing 65.76 percent of the total amount of remittances sent to the household. This implies that more households in Ghana do not receive remittances.

Table 2.2 shows the remitters location and the sex of the remitter. It is observed that, out of the total number of remitters who reside within the country, 58.05 percent of them are males while 41.95 percent are females. Again, 66.33 percent of remitters who stay outside Ghana are males compared to the 33.67 percent of females who reside not in the country. Generally, while it is evident that both males and females are involved in migration and subsequently in sending money to the household, on the average there are more migrants who are males than their counterpart females.

**Table 2.2: Remitters location (%) by sex of the remitter**

Sex of remitter	Location of the remitter	
	Domestic	Abroad
Male	58.05	66.33
Female	41.95	33.67
Total	100	100

**Source: Author's construct from GLSS 6 data**

From Table 2.3, the channel through which remittances flow and the sex of the remitter is presented. It can be seen that the percentage of males making use of the official channel is greater than the percentage of females using the official channel. Likewise, the percentage of males making use of the informal channel is also greater than females using the informal channel. Thus, of the total percentage of the official channel of remittance flows, 71.38 percent of males use this channel with 28.62 percent been used by females. Similarly, with regards to the unofficial channel, about 62.48 percent of males make use of this channel with the remaining 37.52 percent used by females. The implication of the above is that males make use of both the official and the unofficial channels of remittance flows than their counterpart females since they are involved more in migration and subsequently sending remittances.

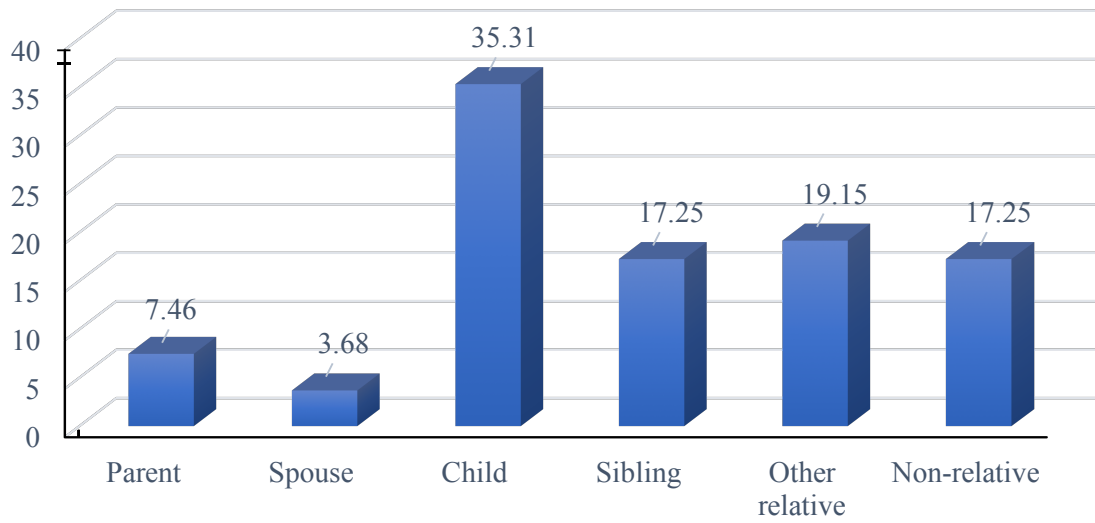
**Table 2.3: Channel of remittance flow (%) by sex of the remitter**

Sex of remitter	Channel of remittance flow	
	Official	Unofficial
Male	71.38	62.48
Female	28.62	37.52
Total	100	100

**Source: Author's construct from GLSS 6 data**

In Figure 2.5, the relationship of the remitter to the household head is shown. The figure indicates that remitters who are children to the head of the household are about 35.31 percent and this constitutes the largest group of remitters to the household. This is followed closely by remittances from other relatives. That is, other relatives remit about 19.15 percent of remittances to the household. Siblings and other non-relatives who tend to send money to the household head constitutes about 17.25 percent each. Parents and spouses tend to send the least amount of remittance to the household. Thus, household heads receive 7.46 percent and 4 percent of remittances from their parents and spouses respectively, with the least being spouses of household heads. Thus, remittances are sent predominantly by children of household heads in Ghana.

**Figure 2.5: Relationship of remitter to household head (N=8,965)**



**Source: Author's construct from GLSS 6 data**

### **2.3 Overview of Agriculture in Ghana**

The Ghanaian economy is typically agrarian. Thus, land as a resource is used primarily for agricultural activities. According to Agriculture Facts and Figures (2016), the total land area (TLA) of Ghana is 23,884,245 hectares. In terms of kilometers, it occupies approximately 239,000 sq. kilometers. Of the total land area, agricultural land area (ALA) occupies 13,600,000 hectares with 6,341,930 hectares of the land under cultivation. Of this, 228,792 hectares of the total area is under irrigation. Furthermore, the area under inland waters constitutes 1,100,000 hectares or 11,000 sq. kilometers according to CIA World Fact Book (2017).

In Ghana, Agriculture is primarily on a smallholder scale with farm holdings not exceeding 2 hectares. There are, however, some large farms and plantations for the production of palm trees, rubber and coconut and to some extent maize and rice production. Agriculture Facts and Figures (2016) estimated that over half of households (51.5%) in Ghana own or operate a farm. Farming is mostly rural, engaging about 83 percent of rural households. The main system of farming is traditional which involves the hoe and cutlass as tools mostly used and largely dependent on rainfall. Mechanized farming is on the low in Ghana, but bullock farming is predominantly practiced in the Northern Savannah. Despite the smallholder nature of agriculture in Ghana, the sector contributes significantly to Gross Domestic Product (GDP). Thus, agricultural growth increased from about 2.8 percent in 2015 to 3 percent in 2016 with the majority of the growth attributed to the cocoa sector (MoFA, 2016). The agricultural sector's contribution to total employment is estimated to be approximately 45 percent. With the services and the industrial sectors accounting for 41 percent and 14 percent respectively after falling next to the services sector in the 2010 population census. The agricultural sector in Ghana has five sub-sectors-crops (excluding cocoa), forestry, cocoa, livestock, and fisheries-

with the most active sub-sector being the crops (excluding cocoa) sub-sector. For instance, in 2016 the crops sub-sector accounted for 67.7 percent of agricultural GDP, forestry, cocoa, livestock and fisheries accounting for approximately, 11 percent, 9 percent, and 6 percent respectively.

Agricultural assets are important factors to consider when studying the impact of agriculture on the economy of Ghana. According to the sixth round of the Ghana Living Standards Survey (GLSS 6), agricultural assets encapsulates land, livestock, and equipment. The agricultural land covers all land owned by the household whether for agricultural or non-agricultural purposes. This, therefore, excludes all land under cultivation but owned by the government or other households. Farmland is also an important agricultural asset in the agricultural sector. The number of farms owned significantly determines the type and amount of production to be done on the farm. Farmlands in Ghana are usually at the subsistence level. It is estimated that 51.5 percent of households in Ghana either owns or operates a farm. Within the agricultural sector, livestock as a form of an asset includes fish farming and poultry. The main form of livestock, as agricultural assets, are cattle, sheep, goats, pigs, poultry and fish farming. A distinction is made between draught animals and cattle according to the GLSS 6. The former is used in the agricultural sector for pulling loads and includes bullocks for ploughing. Poultry is the most widely reared livestock within the agricultural sector, with the least reared been pigs according to the Ministry of Food and Agriculture (2016). In 2016, the index of poultry population was 361 as against 139 and 219 of cattle and goats respectively. The livestock and fisheries sector accounted for approximately 6 percent of agricultural GDP. In relation to agricultural equipment, the agricultural sector in Ghana is not highly mechanized because most farming activities make use of simple equipment such as cutlasses and hoes due to the subsistence level of farming. However, there are few farming activities that are executed on a large and

commercial scale that require the use of sophisticated equipment and machinery such as harvesters, tractors, and ploughs. According to the World Bank (2018), agriculture can help reduce poverty, raise incomes, improve food security and nutrition for 80 percent of the world's poor, who live in rural areas. This is therefore dependent on agricultural assets acquired overtime hence the need to examine the impact of remittance receipts on these assets. The overview of agriculture in Ghana particularly focuses on Agricultural assets. The trends in the farmland, livestock holding and agricultural equipment are examined across GLSS 5 and GLSS 6 and on GLSS 7. Further, the ownership of agricultural assets is analyzed by the sex and the location of the household head.

**Table 2.4: Ownership of Agricultural Assets (%) by the Household**

Agricultural assets	GLSS 5		GLSS 6		GLSS 7	
	Own	Do not own	Own	Do not own	Own	Do not own
Farmlands	79.57	20.43	38.86	61.14	53.36	46.64
Livestock	43.67	56.33	43.44	56.56	28.97	71.03
Agricultural equipment	20.04	79.96	27.97	72.03	41.95	58.95

**Source: Author's construct from GLSS 5, GLSS 6 and GLSS 7 data**

Table 2.4 presents the ownership of agricultural assets; farmland, livestock and agricultural equipment available to the household from waves 5, 6 and 7 of the GLSS. GLSS 5 shows that of the total number of farmlands available, approximately 80 percent is owned by the household with 20 percent of households not owning any farmland. With regards to the household ownership of livestock, households that owned or accumulated any form of livestock was 43.67 percent while those that did not own any livestock were 56.33 percent. Again, the percentage of households that owns agricultural equipment was 20 percent as against the 80 percent that do not own agricultural equipment. Again, GLSS 6 showed that the percentage of the household that owns farmland, livestock, and agricultural equipment was 39, 43, and 28 percent respectively and of those that do not own were 61, 57, and 72 percent respectively. Estimates from GLSS 7 suggests that household ownership of farmland was 53

percent compared to the 47 percent of farmlands not owned by the household. Similarly, household ownership of livestock was about 29 percent relative to the 71 percent of households that did not own livestock. With regards to the household ownership of agricultural equipment, while 41 percent of household heads reported to having acquired agricultural equipment, 59 percent of household heads do not own agricultural equipment. The table above shows that, while growth in farmland has been fluctuating over the period from about 80 percent to 39 percent in 2006 to 2013, it increased significantly to 53 percent in 2017. Household livestock holdings have, however, been declining in recent times from 44 to 43 percent then to 29 percent in 2006, 2013 and 2017 respectively. The only asset that has, in recent times, seen progressive growth in its accumulation by the household is agricultural equipment. Agricultural equipment owned by the household increased from 20 percent to 28 percent then to 42 percent in 2006, 2013 and 2017. This means that, with regards to the household asset accumulation, the Ghanaian household tends to acquire more agricultural inputs or equipment than any other asset.

**Table 2.5: Farmland status (%) by sex and location of the household head**

Household's Farmland status	Sex of household head		Location of the household head	
	Male	Female	Urban	Rural
Owens Farmland	61.23	42.02	23.28	81.78
Do not own Farmland	38.77	57.98	76.72	18.22
Total	100	100	100	100

**Source: Author's construct from GLSS 6 data**

Table 2.5 presents the household ownership of farmland by the sex and location of the household head. It is observed that farmlands are owned more by male-headed households than by female-headed households and also farmland ownership is rapid in rural areas than in urban centers. Thus, 61.23 percent of households headed by males own a farmland as compared to the 38.77 percent of household heads who do not own farmland. Similarly, 42.02 percent of

females who are household heads own a farmland while those who do not own a farmland represents 57.98 percentage points. Again, with regards to the location of farmlands, 81.78 percent of household heads who owns a farmland reside in rural areas compared to the 18.22 percent of household heads who do not own a farmland. Of the number of household heads living in urban areas, 23.28 percent owns farmland with 76.72 percent not owning a farmland. The implication of the above is that, generally, farmlands are owned mostly by males than by females and are operated in rural areas than in urban centers.

Table 2.6 shows that approximately 49.41 percent of males and 28.23 percent of females who are heads of the household own livestock. However, the percentage of male and female household heads who do not own livestock is greater, thus, 50.59 percent and 71.77 percent respectively. Similarly, the household's livestock status indicates that about 17.31 percent and 64.29 percent of household heads from urban centers and rural areas respectively owned livestock. Nonetheless, the percentage of household heads who dwells in the urban centers and do not own livestock is greater, about 82.69 percent. With only about 35.71 of household heads from rural areas not owning or rearing a livestock. Despite the fact that household ownership of livestock across the sex and location of the household head depicts smaller percentage points, household heads who are males own more livestock than female-headed households. Again, the production and rearing of livestock in Ghana is dominant in rural areas than in urban centers.

**Table 2.6: Livestock status (%) by sex and location of the household head**

Household's Livestock status	Sex of household head		Location of the household head	
	Male	Female	Urban	Rural
Owens Livestock	49.41	28.71	17.31	64.29
Do not own Livestock	50.59	71.77	82.69	35.71
Total	100	100	100	100

**Source: Author's construct from GLSS 6 data**

In Table 2.7, the household agricultural equipment status is examined with the sex and location of the household head. The percentage of household heads who are males and own agricultural equipment is greater than the percentage of females who own agricultural equipment, 33.58 percent, and 13.68 percent respectively. For households that do not own agricultural equipment, 66.42 percent are headed by males while 86.32 percent are headed by females. Likewise, while 15.09 percent of household heads from urban centers own agricultural equipment, 88.88 percent of urban household heads do not own. Again, relative to urban household ownership of agricultural equipment, 58.58 percent of households from rural areas own agricultural equipment. This implies that agricultural equipment is owned more by male-headed households from rural areas or who dwell in rural areas.

**Table 2.7: Agricultural equipment status (%) by sex and location of the household head**

Household's Agricultural Equipment status	Sex of household head		Location of the household head	
	Male	Female	Urban	Rural
Owens Agricultural Equipment	33.58	13.68	11.12	58.58
Do not own agricultural equipment	66.42	86.32	88.88	41.42
Total	100	100	100	100

**Source: Author's construct from GLSS 6 data**

## 2.4 Summary

The overview of remittances and agricultural asset accumulation in Ghana revealed that remittances are often a result of migration. It is, however, expedient to know that remittances do not entirely result from migration since migrants could also be the recipients of remittances. Remittances within the Ghanaian environment depict a situation where remittances receiving households fall short of non-remittance receiving households. Thus, households that do not receive remittances are greater than households that receive remittances. While the flow of domestic remittances far exceeds the flow of international remittances, the developmental effects of international remittances are more vividly seen and examined than domestic

remittance. Males tend to remit the household more than females because they are mostly involved in migration than females. Studies examining the channel of remittances flow in Ghana (see, for example, Mazzucato, van den Boom, & Nsowah-Nuamah, 2008) show that remittance flows predominantly occur through the unofficial channel. This is mainly due to the high cost associated with sending money to the household through official channels such as banks and MTO's as portrayed in the overview. While household ownership of agricultural equipment has been increasing over time, and farmland available to the household fluctuating, the households' livestock holding has, however, been declining across waves 5, 6 and 7 of the GLSS. In Ghana, agricultural assets are largely owned and operated by households headed by males rather than female-headed households. Again, most agricultural assets are concentrated in rural areas than in urban centers.

## **CHAPTER THREE**

### **LITERATURE REVIEW**

#### **3.1 Introduction**

This chapter reviews literature pertaining to remittance receipts and agricultural asset accumulation. The general objective of this chapter is to present literature relating to the impact of remittance receipts and agricultural asset accumulation in Ghana. This chapter discusses key theoretical propositions and further presents empirical literature of remittances and agricultural development, and agricultural asset accumulation nexus.

#### **3.2 The Concept of Remittances**

Remittances are variously defined. Most of the definitions are based on “migrant’s and/or worker’s remittances”. Adams Jr. (2011) defined remittances as "regular or irregular contribution in terms of money, goods, and food made or received from persons living abroad or elsewhere" (p. 810). According to the Ghana Statistical Service (GSS, 2017, p. 74), “remittances are household income arising mainly from the temporary or permanent movement of people. It includes funds that flow through formal channels, such as electronic wire, or through informal channels, such as cash carried across borders in pockets.” Usually, the receipt of remittances is not supposed to be paid back. Estimates from the Ghana Living Standards Survey Six (GLSS 6) report indicates that remittances could be sent on a weekly, monthly, quarterly and or yearly basis. While the flow of remittances across a nation's borders is referred to as international remittances, the flow of remittances within a county is known as domestic remittances. Generally, remittances are classified into a group called “transfers” in the Balance of Payments (BOP).

### **3.3 Theoretical Literature Review**

#### **3.3.1 Motives for Sending Remittance**

Theories of remittances are geared towards the motivation for remitting. Thus, the literature has documented several theories to elucidate on the reasons for which migrants decide to remit their households in the home country. The question that has been widely asked about remittances is: why do private transfers occur between households? The literature regarding the motivation to remit was sparked by Lucas and Stark (1985) in their ground-breaking work, "Motivations to Remit: Evidence from Botswana". This has since been extensively used as the basis for the discussion of the motives for remitting families, households, and friends.

#### **Altruism**

In the altruistic model, a tender-hearted person cares about others welfare (Cox, 1987). For instance, an adult child might care for the parent by sending remittances to the parent. The underlying principle of the theory of altruism is that individuals staying away from home are particularly interested in the welfare of those that have been left behind, and consequently, obtain contentment from improvement in their well-being and living Standards. Boakye-Yiadom (2008, p. 100) notes that "altruism exists when a donor's utility function partly depends positively on the utility of the recipient". Thus, a kind person (the parent) might regularly send remittances to another person (the child) because an improvement in the other person's (the child) welfare will increase the utility of the kind person (the parent).

A key attractive trait of the theory of altruism is that it is "tractable and leads to straightforward predictions, although much depends on the specifics of the model of altruism" (Rapoport & Docquier, 2005, p. 12). The altruistic model, however, envisages remittance receipts declining with the passage of time. The literature highlights two reasons for the decline in remittance

flows. The first is, as the length of stay of the individual, in the host country, becomes longer familial connection begin to decline. Secondly, if the individual plans on staying for a longer period in the host country, he/she may bring the nuclear family to stay in the host country together. This will, therefore, cause the amount of remittances sent by the individual back home to reduce drastically.

### **Exchange or Self-Interest**

Pure self-interest is another motivation for remitting and according to this theory, "reciprocity underlies remittance flows". It is sometimes known as the exchange model (Boakye-Yiadom, 2008; Hagen-Zanker & Siegel, 2007; Lucas & Stark, 1985). Other scholars see the self-interest motive as an inverse to the altruism motive. In this model, the remitter is motivated by his own monetary and economic interests. Thus, the individual who has become wealthy after saving sufficient funds in the destination country realizes how important it is to invest in the home country. He, therefore, accumulates wealth by purchasing financial assets, lands, houses and other tangible properties. The argument behind this theory is that, at every point in time, the migrant who has been successful in the destination country saves. A need, then, arises on how (in which assets) and where (in which country) to accumulate wealth. An obvious place then to invest, at least part of his assets, is in the home country by buying property, land and financial assets among other things. In relying on the exchange motive and in the absence of altruism, there exist three motivation for which an individual remits the family: the first is the desire to inherit, second is the intent to return home and finally, the tendency to demonstrate a laudable behavior as investment for the future (Hagen-Zanker & Siegel, 2007; Lucas & Stark, 1985). The only distinction between pure altruism and pure self-interest is seen in the desire of the remitter to inherit. Otherwise, both motives for remitting is done for the purpose of improving the welfare and wellbeing of the family.

### **Implicit Contractual Agreement: Loan Repayment**

Cox and Jimenez (1990) provided the first theoretical modeling to the loan repayment theory. The loan repayment contract merges the features of investment and repayment. Otherwise known as the investment motive, the loan repayment theory is seen as an exchange theory in the setting of imperfect credit markets but in a framework comprising social and intergenerational fundamentals. With this theory, the remittance process takes place at the household level rather than the individual level. Thus, the household is the main unit of analysis in remittance discussion. According to this theory, the household constructs an implicit arrangement between the individual living away from home and the ones in the home country. This theory implies that the household or family spends in relation to the education, training and the costs associated with migration. Thus, the family invests in the education and/or migration of the individual who is perceived to be a high yielding asset. This forms the loan (investment) component of the theory. The individual with time is expected to pay the investment made on education, training and migration costs. Hange-Zanker and Siegel (2007, p. 7) report that "during the next time period the migrant is able to find a better-paid job in the city or abroad due to the education acquired and will send remittances to repay the family for the initial investment". This is the repayment part, which comes after the individual is well established in the foreign country and his income profile starts rising over time. In this case, the contract agreement has as a target increasing the family income rather than reducing uncertainty.

### **Implicit Contractual Agreement: Co-insurance**

A variant of the theory of remittances as an implicit family contract between the migrant and those at home relies on the notion of risk diversification. Due to market failures brought about by imperfections in the insurance and capital markets, diversification of risk has become problematic. This is due to the deficiency in financial assets that can be used as a hedge against such risks. In this model, a family member is supposed to move or migrate to a country where the labor market does not correlate with the home country's labor market. The model assumes that, if the above condition holds, then the household can diversify its risks by sending migrants, mostly educated ones, abroad. Lucas and Stark (1985, p. 905) note that "provided that the vagaries of the rural and urban context are not highly positively correlated, it can then be mutually beneficial to both migrant and family to enter a co-insurance contract." Thus, the co-insurance arrangement can be efficient and effectual if and only if the risks at the home country and the risks in the foreign country are not correlated.

### **3.3.2 Remittance transfer channels**

The flow of remittances occurs through two channels; official and unofficial. In the literature, transfers that make use of financial intermediaries such as banks, credit unions, money transfer operators (like MoneyGram and Western Union) and postal services are seen as official channels whereas unofficial channels involve the use of courier - family members and friends-in sending funds. The informal channel often does not require formal certification and are devoid of transaction costs (Gibson et al., 2006). According to Orozco (2003), hand-delivery via courier is the most aged and primitive mode of remitting funds. He further notes that such a method is prevalent in African and amongst the very poor nations of the developing world. In Latin America, 10 percent of all private transfers are hand-delivered, by the remitter or by a third person, either a friend or an acquaintance, which is mostly the case of Africa (Suro, 2003).

Despite the use of courier as a means of sending money to families, households, and friends, Suro (2003) also note that the use of ordinary mail is widely used by Latinos in the United States. Although such an informal method of remitting households is very risky, it, however, accounts for 7 percent of all transfers made by Latinos.

Informal channels are used where there is the absence of financial infrastructure or the financial infrastructure is fragile and mistrusted due to bankruptcies, political upheavals or economic distresses. Globally, estimated unofficial remittance transfers range from 50 percent to 250 percent of formal transfer (Freund & Spatafora, 2008). For instance, it is estimated that at least 80% of remittances to Uganda and Sudan are sent through informal channels (Sander, 2003). Findings by Mazzucato et al. (2008) show that 65 percent of all remittance transfer to Ghana are sent unofficially. Da Cruz et al. (2004) report that of the total amount of remittances that flow into Comoros, unofficial flows constitute about 80 percent. In addition, according to Ratha (2013), data on France show that about 70 percent of remittances from France to Mali and Senegal are through unofficial means.

Formal remittance channels are typically more expensive. This channel is used by countries whose financial system is highly robust and very liberalized. Sander (2003) note that in Kenya, for instance, “bank transfer services are used more than in Tanzania and Uganda for domestic and intra-regional money transfers because Kenya has a relatively well-developed banking industry”. According to Freund and Spatafora (2005), official remittance channels make use of financial intermediaries such as banks and money transfer operators like Western Union and MoneyGram. These are intensely involved in the transfer of funds worldwide. Apart from these formal channels in remitting funds, other formal immigration agencies exist in the United States that are involved in the transfer of money globally. These agencies are called “ethnic

stores” and are largely engaged in remitting money to most Asian countries like Pakistan, India, and Bangladesh. Although these ethnic stores transfer relatively smaller amounts of remittances, they account for about 30 percent of the overall amount of remittances transferred.

### **3.3.3 The cost of transferring remittances**

Numerous studies, worldwide, have indicated that remittances flowing from informal channels to formal channels are relatively modest. The estimated cost for sending US\$ 200 to middle-and-low-income countries is fairly stable standing at 7.1 percent in 2018 according to the World Bank (2018) which is satisfactory above the target of 3 percent of the Sustainable Development Goal 10.c.1. Remittance transfer costs remain above 10 percent in Africa (World Bank, 2018). While South Asia has the lowest cost of sending funds about 5 percent, sub-Saharan Africa remains the costliest region to send money (World Bank, 2018). This high transaction cost associated with remittance transfer to Africa is due mainly to the absence of a competitive market enclave and the scanty volumes of formal flows. For instance, sending money from the United States to countries outside Latin American is very costly relative to those in Latin America. This is because of the increase in competition between transfer institutions targeting the Latin American money transfer market and the increasing role of technology, particularly mobile banking and online money transfer (Orozco, 2003). This has, therefore, propelled competing institutions to reduce the price charged in sending money to Latin American faster than in other regions like sub-Saharan African and the Middle East and North Africa hence a decline in transfer costs amongst institutions, big or small. The cost associated with the informal channel of remittance transfer is estimated to be about 1-5 percent (Orozco, 2003; Sander, 2003). These informal mediums, because they work closely with their clients, are usually faster and very convenient. This is because they are not compelled by rules and regulation binding financial institutions and other capital market activities. Remittance

flow that makes use of the official channel is usually more expensive especially for financial institutions than informal channels because they help greatly in reducing risks associated with the transfer of funds.

### **3.3.4 Determinants of Remittance Flows**

The empirical literature has displayed some level of creativity and ingenuity in measuring the different determinants of remittance flows from the factors pertaining to the decision to remit. Although most of the empirical studies have investigated loan repayment, altruism, self-interest/or exchange and co-insurance as the determinants of remittance flow, that is, the factors affecting the size of remittance flow, others have also considered different factors as influencing remittance flows (Boakye-Yiadom, 2008; Brown, 1997; Banerjee, 1984). In investigating the determinants of remittances, several factors have been hypothesized to influence remittance flows with the striking one's being remitters income, educational attainment of the benefactor, the income level of the benefactor and household's creditworthiness (Boakye-Yiadom, 2008; Gubert, 2002; Lucas & Stark, 1985). Other factors influencing remittance behavior, if remittances emanate from a migrant, include migration status, years since migration, the employment level of the migrant and the rate of dependency of the household (Boakye-Yiadom, 2008; Brown, 1997; Page & Plaza, 2006).

#### **3.3.4.1 Microeconomics determinants of remittances**

In the empirical work of Lucas and Stark (1985), the remitters' income was seen to play a significant role in influencing remittance behavior. Thus, they observed that the migrants' income and the remittance level is positively related. In a comparative study of remittances from emigrants of the Pacific island using a Tobit model, Brown (1997) established that high levels of migrant incomes result in larger amounts of remittances flow. Similarly, using a Tobit

analysis, Liu and Reilly (2004) investigated the factors influencing the transfer of remittances by migrants to rural households. The authors observed that labor earnings are significant in influencing remittance flow. According to Hangen-Zanker and Siegel (2004), most theories on the determinants of remittance transfer see remittance as correlating positively with the migrant's income and negatively with the household income.

Another factor that influences the flow of remittances is the marital status of the migrant. In examining the role of altruism in the remittance motivation literature, Hangen-Zanker and Siegel (2007) note that migrants who have left their spouses in the home country are more likely to send large amounts of remittance because of the altruistic feelings. They, however, note that remittances are more likely to drop significantly, both in terms of amount and probability, if the spouse joins the partner in the destination country. Banerjee (1984, p. 300) also points out that, "migrants who have left their wives in the rural sector are more likely to remit than unmarried migrants". Most empirical studies find marriage arrangement as very instrumental in the amount of remittance received.

Educational attainment of the migrant is known to influence the flow of remittance in the empirical literature. The migrants educational level influences remittance flow in two ways. The most obvious one is through the effect on the donor's income. The second reason stems from the fact that, since the migrant's level of education is an indication of the amount of educational investment made by the family or the household, it is expected to influence remittance flows, particularly in the context of an implicit family agreement loan repayment model. In a study on Western Mali, using a Powell's Censored Least Absolute Deviation (CLAD) method, in addition to a more conventional parametric technique, to analyze the determinants of remittances from both internal and international migrants, Gubert (2002) finds

robust evidence supporting the view that migrants with higher levels of education are more likely to remit higher amounts than their colleagues with lower educational attainments.

#### **3.2.4.2 Macroeconomics determinants of remittances**

The economic activity abroad determines the flow of remittances. Evidence has shown that improvement in the economic prospects of a migrant's country increases the likelihood of getting employment and earning better wages. This enables migrants to send more remittances, encouraging greater emigration, and increasing future remittances. In the analysis of Kapur and McHale (2003) in their study on Ecuador reviewed that economic depressions have a significant effect on the amount of remittances received. Therefore, economic downturns within the home country will increase both the flow and the size of remittance to the home area given that the economic conditions in the host country do not correlate with the home area's economic conditions. Similarly, the empirical study of Yang (2008) and Yang and Choi (2007) on the Philippine economy revealed among other things how movements in the exchange rate affect the amount of remittance. They found that an appreciation of the migrant's currency relative to the Philippine peso increases the amount of remittance to be received by the home country.

According to Owiafe (2008), institutional and economic policies in both the home area and the migrant country are a significant macroeconomic factor that influences the amount and size of remittance flow. She notes that "the presence of exchange rate restrictions and black market operations may discourage emigrants from sending remittances. In particular, it is likely to shift remittances away from formal channels, such as banks, toward informal and unrecorded channels; any remittances may also be kept in the form of foreign currency cash" (Owiafe, 2008, p. 11). The manifestation of macroeconomic unsteadiness such as inflation and exchange

rate overvaluation impinges on the size and the amount of remittance received from the migrant. However, the efficiency and effectiveness of financial intermediaries such as growth in the financial sector attract more remittances both from the senders and recipients' perspective.

### **3.3.5 The Developmental Impact of Remittances**

Most studies on remittances have focused on developmental impacts. Thus, the developmental impacts concentrate on issues of economic growth, welfare level and savings, poverty alleviation, income and inequality, investment, education, health, and microenterprises and entrepreneurial activity and agricultural change and productivity.

The scientific literature on the impact of remittances on income inequality is varied. Empirically, it is estimated that remittances from abroad account for almost 40 percent of household income to developing countries. Myriad of studies have established that remittances lessen poverty despite the fact that its magnitude is rather modest. For instance, Adams (2011) points out that the inclusion of remittances into income level of the household reduces the share of people living in poverty by 3 to 5 percent, on average, at the country level. The literature on the economic impact of remittances on income is widely debated. While remittances help boost income and help raise both individuals and households out of poverty, it also widens income inequality between rich and poor households. The broadest study, perhaps, by Adams and Page (2005), using 71 emerging economies, examined the effect of remittances received from abroad on poverty. While controlling for causality, using an instrumental variable approach, they found that, for any 10 percent increase in per capita remittance, the share of people living in poverty will decline, on average, by 3.5 percent in a developing country.

In investigating the relationship between remittance and inequality, the literature attempts to construct a counterfactual situation. To Adams (2011, p. 816), this "counterfactual situation makes use of econometric methods to impute the incomes of migrants had they stayed and worked at home". Barham and Boucher (1998), Rodriguez (1998), and Adams and Cuecuecha (2010), in Nicaragua, Philippines and Indonesia respectively, constructed a counterfactual condition and observed that with the addition of remittances to household income, the Gini coefficient of inequality increases. In the study by Barham and Boucher (1998) and Rodriguez (1998), selectivity bias in remittance receipts was not controlled for hence their findings were criticized by McKenzie and Rapoport (2007). According to the studies of these authors, which was built primarily on a large household survey from rural Mexico, the kind of migrant selectivity alters over time. For instance, by dwelling on historic state-level migration rates using a two-stage least squares technique and an instrumental variables approach, McKenzie and Rapoport (2007) found out that, districts that experience little or no levels of migrating outside the district initially increases income inequality but with increasing levels of migration, and the consequent receipt of remittance, migration would tend to reduce income inequality.

With regards to empirical studies examining the effect remittances have on health and education, no clear distinction has been made. Most often mixed results emerge. At the macro-level, most studies find that both international migration and remittance improves infant mortality and child health through raising the household income and the increase in the mothers' health knowledge. Duryea et al. (2007), using a population census data of Mexico probed for the remittance effect on infant mortality. Dwelling on historic state-level migration rates in Mexico using a two-stage least squares technique and an instrumental variables approach in controlling for endogeneity inherent in international remittances, a positive association between remittance and infant mortality was observed by the authors. They note

that remittances have only positive effects in lessening infant mortality during the first 5 weeks of the infant's being and are typical in urban centers, however, in the rural areas, the impact of remittance is statistically insignificant. On the contrary, the empirical work of Hildebrandt and McKenzie (2005) pointed out that remittances reduce child mortality in the rural areas of Mexico.

The macroeconomic effect of remittances according to literature depends on how recipients choose to utilize the monies received. This makes it quite cumbersome to establish the aggregate consequence of remittances on the economy as a whole. The impact of remittances on growth in cross-country studies is inconclusive. Research that concentrates on the labor supply response of recipient households finds that remittances tend to lower growth through the unproductive use of remittances received (Azam & Gubert, 2005; Chami et al., 2003). Previous and existing studies on economic growth have established positive, negative, direct or indirect effects of remittance on developing countries. In a panel study of 113 countries for a period thirty years, Chami et al. (2003) stated clearly that “remittances are negatively associated with economic growth”. This result is consistent with their demonstration in which remittances weaken recipients’ incentives to work and, therefore, lead to poor economic performance.

The welfare-enhancing and poverty alleviation impacts of remittances are critical at both the microeconomic and the macroeconomic levels. Using a random effect generalized least squares (GLS) regression model, Orozco (2003) observed that remittances enhance the wellbeing of the household and aid to sustain household welfare brought about by economic shocks. Similarly, Boakye-Yiadom (2008) found that rural households who receive remittances from urban household dwellers, on average, experience welfare gain. Lopez et al. (2007) and Acosta

et al. (2009) found that remittances have reasonable poverty declining effects for the whole population but stress that remittances appear to have important poverty reduction effects for their study on Ecuadorian migrants' households. Contrary to his view, Bertoli and Marchetta (2014) observed that remittances limited poverty reduction effects for Ecuador.

Literature puts that, the total savings of a country is the sum of the nation's foreign savings and domestic savings. Remittances have a total savings effect on the economy. Numerous studies have shown that remittances have a sustainable effect on living Standards, which is seen in the improvement in the consumption status of the household. A great amount of remittances is used for day-to-day expenses like food, clothing and health care. For instance, Quartey (2006) reports that remittances improve household welfare. Baldé (2011) in his study on sub-Saharan African indicate that private unrequited transfers are effective in inspiring savings and investment in the region. In Ghana, Quartey et al. (2018) using a probit model and a treatment effect estimator established a connection between remittance and savings. They observed that household receipts of remittances affect significantly their propensity to save. And that, households who receive international remittances are more likely to save compared to their counterparts who receive domestic remittances.

Private income transfer is known to significantly stimulate entrepreneurial activity or microenterprises according to literature. Thus, Dustmann and Kirchamp (2002) note that remittances accrued through savings can be used as a very important source of income or startup capital for setting up a business. A study conducted in West-Central Mexico by Massey and Parrado (1998) on 30 communities showed that remittances received from working in the United States provided startup capital for 21 percent of new businesses established. More precisely, Amuedo-Dorantes and Pozo (2006) conducted a study on the Dominican Republic

with a small household survey. By employing a system of simultaneous probit model to control for simultaneity, they observed that the receipts of international remittances by the household are less likely to be used to establish a family business. The authors believed that one reason for such an outcome is the fact that remittances increase the reservation wage of the head of the household making them less likely to invest in a business (Adams, 2011). A more positive finding was arrived at by Woodruff and Zenteno (2007). Using an instrumental variable approach of a large survey of small business entities in Mexico, the authors find that remittances from abroad provide the capital needed to expand and grow a small business.

### **3.4 Empirical Literature Review**

#### **3.4.1 Determinants of the Ownership of Agricultural Assets in Ghana**

Several factors are responsible for determining the household ownership of agricultural assets. These factors determine whether the household owns a specific form of asset or not. Some of the factors known to influence the household asset ownership include the household income, the educational level of the household head, and the average years of schooling for household members among others. In the empirical study of Bohme (2015), the determinants of assets include household income, educational level of the household, age, and age squared of the household head and the sex of the household head. According to Bohme (2015), these factors are significant in influencing the household ownership of agricultural assets. Similarly, Damon (2010) examined the determinants of total land holding in El-Salvador. She notes that the number of adults, level of education of the household head, age of the household head and the number of household members are significant factors that influence the household ownership of land.

Vasco (2011) found that while household characteristics play a crucial role in determining the household acquisition of cattle in rural Ecuador, the availability of credit to the household is also a very important determinant. Using a probit model to examine the household cattle acquisition status, the availability of credit was significant at 1 percent and this increases the household chances of acquiring cattle by 7 percent. The presence of young men and women in the household, however, reduces the household ownership of cattle by 10 percent. Similar results were obtained by Gray (2009) who observed that the presence of both young men and women in the household are not significant in determining the household acquisition of agricultural inputs or equipment. The author notes, however, that the presence of adult men and women, age of the head, and the marital status of the head play a significant role in influencing the ownership of input use.

Piras, Vittuari, Möllers, and Herzfeld (2018) in examining the effect that remittance inflows have on smallholder farming activities found that the household income, number of adults, household size and the number of children in the household influence farming practices within the household and subsequently its land ownership. Chiodi et al. (2012) found households headed by males to be a significant determinant of agricultural asset ownership. Wouterse and Taylor (2008) observed that the stock of inter-continental migrants (lagged) influence the household ownership of livestock, while the stock of continental migrants(lagged) do not have any influence on livestock holding. However, both the stock of continental and inter-continental migrants increase the household livestock acquisition. Again, the authors realized that, although the number of dependents in the household significantly influences the acquisition of livestock; it reduces the household ability to acquire livestock.

### **3.4.2 Remittance and Agricultural Asset Accumulation**

Agriculture according to literature is said to have a positive impact on economic growth, welfare and wellbeing, and poverty alleviation. Myriad of studies have underscored the role of the agricultural sector in enhancing growth and development (Diao, Hazell, & Thurlow, 2010; World Bank, 2016; Agricultural Development Policy, 2015). According to World Bank (2016), the agricultural sector can facilitate movement out of poverty, help raise incomes and improve food security for 80 percent of the world's poor living in rural areas and mainly working in farming and farm-oriented activities. Agricultural development is seen as a powerful tool in ending extreme poverty and improving wealth (World Bank, 2016).

According to Aguilar-Støen, Taylor, and Castellanos (2016), Davis and Lopez-Carr (2014), De Brauw and Rozelle (2008), Gray and Bilsborrow (2014), and McCarthy, Davis, Carletto, and Maltsoğlu (2006), private unrequited transfers play a significant role in agricultural development. Given the size of these financial transfers, it is essential to study their effect on households' decision with regards to agricultural investments taking into account the fact that agricultural sector represents about 17 percent of Africa's GDP and that 75 percent of the African population live in rural areas with their livelihoods dependent on the agricultural sector according to the Federal Ministry for Economic Cooperation in their Agricultural Development Policy report 2015.

Regarding the impact of remittance receipts on agricultural asset accumulation, there is a dearth of research or studies. Therefore, the empirical modeling of remittance and asset accumulation relies on the impact evaluation literature in relation to remittances and agriculture change. Despite the dearth of research, with regards to remittances and agricultural asset accumulation, a number of studies have actually tried to examine the effects of remittance receipts on

agricultural land, agricultural productivity, agricultural labor loss, ownership of farmland and livestock. However, little or no studies have envisaged investigating the impact of remittance receipts on all three outcomes of agricultural assets. A study that came close to examining the impact of remittances of agricultural asset is that of Damon (2010).

This study will add to the literature as it will augment the paucity of literature on remittance and agricultural asset accumulation by making it possible to know the effects of remittances on each outcome of an agricultural asset. Again, most studies investigating the remittance effects on agricultural assets rely on an instrumentation strategy, both in panel and cross-sectional studies, due to causality and endogeneity problems. This study assumes selectivity bias, brought about through self-selection and sample-selection because household remittance receiving status is not randomly generated. Therefore, instead of the conventional instrumental variables approach predominantly used in the remittance literature on remittances and agricultural change, the treatment effect model is used in analyzing the impact of remittance receipts on the accumulation of agricultural assets. The advantage of the treatment effect model is that it has several estimators that can be used as robustness checks to ensure stability and consistency of coefficients.

Damon (2010), in a household level survey, using a panel dataset on El-Salvador examined the effect of both international migration and remittances on land use allocations, agricultural asset accumulation, and agricultural input use and returns. From the empirical analysis of the results, she found that remittances significantly affect land use allocation by increasing the area of land devoted to the production of grains. By measuring agricultural asset in the form of land and livestock, she found weak evidence between remittance receipts and household accumulation of agricultural assets. Thus, she examined the effect of migration and remittances on only land and livestock holdings ignoring agricultural equipment as a form of asset. Instead, she

investigated the effect of remittances on the use of agricultural inputs, and not on the household accumulation of agricultural equipment. In addition, she found weak evidence between remittances and the return to agriculture. Thus, anytime the household receives remittance, the returns to land and labor decline.

Although this may seem similar, this study differs from Damon (2010) in two regards. First, while this study treats agricultural inputs or equipment as an asset, Damon saw it as an input to complement agricultural productivity. The other distinction lies in the approach taken. Thus, while Damon corrected for selectivity bias using fixed effects approach, this study will make use of treatment effect model to correct for selectivity bias inherent in remittance studies. Consistent with this result was the empirical study of Rozelle et al. (1999) who used the NELM framework to trace the connection and linkages between migration, remittances and agricultural productivity. The authors note that, in the North-Eastern part of China, labor migration raises the welfare of rural farming households through the receipts of remittances. They, however, question whether the receipt of remittances significantly offset the declining rate of grain production in the region.

Gonzalez-Velosa (2011) using fixed effects and an instrumentation approach to explore the macroeconomic shocks at the migrant's destination while disaggregating migration effects from remittances effects on agriculture in the Philippines found no effect of remittances on the number of farms, farmed area, and agricultural labor. The findings suggest that the receipts of remittances from migration do not facilitate movement out of agriculture, instead, remittances promote farming practices by increasing the number of farms dedicated for the production of commercial crops, reduce the number of farms used for crop diversification and facilitate the increased use of technologies for mechanized rice farming in Philippines. Gonzalez-Velosa

(2011), however, considered only the number of farms available to the household as a measure of an agricultural asset while concentrating on agricultural labor loss.

Using a cross-sectional data from a Living Standards Measurement Survey (2005/2006) to investigate the effect of international migration and remittances on agricultural production patterns, labor relationships and entrepreneurship in rural Ecuador, Vasco (2011) indicate that the likelihood of acquiring livestock is higher for households with migrants than for their counterpart households without migrants. Nonetheless, the monthly receipts of remittances by the household have no influence on the household likelihood of acquiring livestock. Vasco points out that because the production of livestock is less labor demanding, the migrant household will shift from the production of crops to livestock production in order not to be affected by the household loss of labor through migration. The results obtained from Vasco was in line with previous studies that indicate that the migrant household switches from crop production to the rearing of livestock as a result of a loss in the household labor (Miluka et al., 2007). Vasco however, used a probit model to investigate the household acquisition of livestock while controlling for endogeneity problem using an instrumental variable. The challenge with his study was he capturing the household livestock status as binary; whether the household owns livestock or not. This manner ignores variations in the household livestock status.

Gray (2009) determined that households that receive remittances in Southern Ecuador invested more in agricultural inputs and the use of land than their counterpart households that did not receive remittance. The study pointed out that production yields are complemented by the receipts of remittances and are further used to reduce labor demand for household members staying in the home country. Miluka et al. (2007) point that households that have migrants spend less in the rental and purchase of agricultural inputs and equipment relative to households

that do not have migrants and subsequently, do not receive remittances. They further note that, rather than spending remittances on labor demand to augment the loss of household member due to migration, households prefer to invest in activities that are less labor intensive, specifically, the production of livestock. Consistent with this was the results of Wouterse and Taylor (2008) who found that remittances facilitate household investment in livestock production than crop production. Gray (2009) focused on the accumulation of agricultural land for agricultural production only. Similarly, the challenge with Miluka et al. (2007) was a concentration on agricultural labor loss due to migration of the household members, hence the acquisition of agricultural assets was not thoroughly investigated.

The empirical study of McCarthy et al. (2006) indicates that remittances inflow to migrant households' shift the pattern of production from crop to livestock production in Albania. The authors instead of attributing it to labor scarcity suggest that migrants' households shift from crop production to livestock rearing because it is more lucrative than crop production. According to Pfeiffer and Taylor (2007), migration has no effect on livestock production in Mexico. In explaining this, the authors note that because livestock production does not require any complex activity, even marginal labor force can be used for the production process.

Chiodi et al. (2012) in a panel study of rural households analyzed the linkage between migration, remittances and asset accumulation in Mexico from 1997 to 2006. By differentiating between productive and non-productive assets and controlling for asset accumulation effect, they find that rural Mexican households are inclined to use remittances to invest in productive assets. The authors note that migration may be a household strategy of accelerating the

accumulation of productive assets. They indicate that "the general idea is that remittances may help alleviate credit constraint for poor households, thus allowing them to invest in productive assets that will be optimal under complete markets". Results from their study indicate that households that send migrants for the purpose of receiving remittances for investing in productive assets, reduce their investment in 'non-productive assets' alongside so that they can further raise funds to contribute to their physical investment.

Piras et al. (2018) using logistic regression to examine the likelihood of remittance receipts affecting investment in agricultural assets (farmland, machinery, and cattle) observed that a weak association exists between remittances and agricultural investment. Thus, Piras et al. (2018) found that remittances do not impact on the household accumulation of agricultural asset. Similarly, using data on Mexico and separating agricultural assets from livestock holding, Bohme (2015) observed that households that receive foreign remittances have a greater chance of accumulating agricultural assets than their counterpart households that do not receive remittances. He, however, did not find remittances enabling investment in risky activities like livestock production. This to him meant that "households rely on agriculture for their daily consumption throughout the life cycle. Hence, we should not expect a strong investment in agriculture in general but only in the activities that secure the subsistence of the household" (Bohme 2015, p. 19).

Jokischl (2002) examined the effect of intercontinental migration on agricultural production and land-use in the highland area of Ecuador. He notes that contrary to previous studies, on migration, remittances and agricultural change, there has not been any instance where migration has facilitated or enhanced agricultural abandonment nor has remittance receipts improved agriculture. In Indonesia, Leinbach and Watkins (1998) found that remittances are geared towards improving agriculture, thereby making it possible for small-holder farmers to buy inputs, increasing yield, growing market crops, expanding irrigation and used to overcome capital or credit hindrances.

Using a Latin American Migration Project data and a multivariate logistic, Poisson and Beta regression models to establish changes to agricultural land use in both migrant and non-migrant households in Nicaragua, Guatemala, El Salvador and Costa Rica, Davis and Lopez-Carr, (2014) find that the number of months spent abroad and the remittances returned with do not transform into massive farm sale and cattle ranching. But farmers are investing remittances into pasture land holdings and crop production. Similarly, Aguilar-Støen et al. (2016) assessed the effects of migration and remittances on land tenure, agriculture, and forests. The finding suggests that remittances enable the household to access agricultural land.

Relying on a relatively small sample size of 102 households from the North, Central and Southern part of Moldova, Bolganschi (2011) investigated the effects of remittances on agricultural land, farm efficiency and the allocation of labor resources to agriculture as a whole. The findings show that while migration has facilitated a decline in the household participation in agriculture especially with regard to land cultivation, remittances received are used to invest

in agricultural inputs on lands leased out to other individuals. In a similar study conducted by Mendola (2008), the author found that households that are more likely to participate in costly "high return migration" increase their chances of using new agricultural technologies, thus achieving higher productivity than their counterpart households that cannot embark on "high return migration".

While empirical studies on the impact of remittances on agricultural development in Africa have not been prolific, the literature provides the same results and conclusions. Gubert (2002) points out that remittances have no impact on productive investment, by using Powell's Censored Least Absolute Deviation (CLAD) in Western Mali to assess the influences of shocks on the behavior of remittances. Contrary to the above, Wouterse and Taylor (2008), using a limited-dependent variable method investigated the impact of intercontinental and continental migration on the choice of activity and incomes of rural households. The findings from the study showed that continental migration had no impact on agricultural and livestock activities, but rather a small effect on non-agricultural activities. Intercontinental migration, which are generally of a long-term nature, generates a large amount of remittances and stimulates livestock and agricultural production, although it negatively affects basic and non-agricultural activities.

### 3.4.3 Studies on remittances in Ghana

Remittance studies during the mid-1980s were scanty. This generally was due to the dearth of literature as a result of the lack of household-level data. Despite the scarcity of data in examining the economic effect of remittances in Ghana, the ground-breaking work of Caldwell (1969) became the benchmark for most migration and remittance studies. Caldwell's study of domestic migration in Ghana provided significant insights into migrants' remittance transfers. In recent times, remittance studies have been mushrooming in Ghana with a couple of these studies relying on data from either wave of the Ghana Living Standards Survey (GLSS) (see, for example, Quartey et al., 2018; Boakye-Yiadom, 2008; Quartey, 2006) with others making use of data from the World Bank World Development Indicators (WDI).

Boakye-Yiadom (2008) reports that in Caldwell's discussion of domestic migration, the flow of remittances is the unique feature of migration. In a survey that covered 1,782 rural households and 585 urban households, Boakye-Yiadom (2008, p. 114) pointed out that Caldwell (1969) observed that "migrants' feelings of obligations to their rural homes are widespread. This sense of obligation- which appears to reflect both altruistic and exchange considerations-is central to the flow of remittances established in the survey". Quartey (2006) notes that the findings of Caldwell (1969) show that "migrants spent remittances to pay for schooling and wages of farm laborers and to develop small businesses." Similar findings have also been observed in recent times (Akyeampong, 2010; Boakye-Yiadom & Lambon-Quayefio, 2017; Gyimah-Brempong & Asiedu, 2015).

Evidence from the empirical study of Litchfield and Waddington (2003) that used the GLSS data set to examine the welfare outcomes of migrants and non-migrants in Ghana found that households with migrants have a higher Standards of living than households without migrants. Quartey and Blankson (2005), using waves 3 and 4 of the GLSS, examined whether migrant remittances reduce the effect of macro-volatility on households in Ghana. They found that migrant remittances balance the influence of macroeconomic crises, especially for food crop farmers who form the poorest of the poor in Ghana. In his analysis of the links between rural and urban areas and well-being: the case of Ghana, Boakye-Yiadom (2008), using data from the 1998/99 GLSS and constructing the hypothetical scenario, found that both migration and remittance income affects the level of poverty of participants. In a more recent study, Quartey et al. (2018) in examining the interrelationships between remittances and savings in Ghana using a treatment effect technique, found that receiving remittances increases the probability that the household will save. The authors indicate that, although remittances increase the propensity to save, households that receive international remittance saves more compared to households that receive domestic remittance.

Studies investigating the impact of remittances on education and schooling in Ghana are prolific. Gyimah-Brempong and Asiedu (2015), using cross-sectional and pseudo-panel data from Ghana, examined the impact of remittances on investment in education. According to their findings, remittances facilitate education in human capital formation because the likelihood of the household enrolling their children into primary and secondary education increases significantly with remittances. The finding of remittances significantly influencing the probability of the family enrolling children into primary and secondary education is particularly high for remittances from abroad.

According to Boakye-Yiadom, (2008), studies on Ghana's remittances focus more on migrant remittances (see, for example, Boakye-Yiadom, 2008; Gyimah-Brempong & Asiedu, 2015; Quartey, 2006). He notes further that, because of the dwelling on migrant remittances, non-migrant remittances seemed to 'play less a role' in Ghana's remittance study. However true this may be, it is still essential to know the extent of Ghana's non-migrant remittance. Although evidence from the GLSS show that Ghanaian households receive more domestic remittances than international remittances, the majority of remittance studies dwell on international remittance. That notwithstanding, there are still areas of further study that possibly can make use of domestic or internal remittance. Also, despite the myriad of studies of remittances on various outcomes, there are still other areas that have been scarcely examined.

### **3.5 Summary**

This chapter provided a review of the theoretical and empirical literature on remittance and agricultural asset accumulation in Ghana. The purpose was to determine the impact of remittances on agricultural asset accumulation. The theoretical issues examined include the concept of remittance, the motives for sending remittances, various channels to remittance flows, the costs associated with the remittance flows, and the determinants of remittances where both the microeconomic and macroeconomic determinants of remittances were considered. This was then followed by remittances on development outcomes and the determinants of the ownership of agricultural assets in Ghana. In relation to the empirical review; remittances and agricultural asset accumulation, and remittance studies in Ghana were considered. In the review of empirical studies on remittances and agricultural asset accumulation, the impact evaluation literature on remittances and agricultural change was used

because of the paucity of literature with regards to remittances and agricultural asset accumulation.

## **CHAPTER FOUR**

### **METHODOLOGY**

#### **4.1 Introduction**

The purpose of this chapter is to discuss the methods, data and estimation techniques used to achieve the objectives of the study. It is divided into two sections. The first section deals with the methodology with the second section dealing with the data sources and the data analysis procedure.

#### **4.2 Main research questions**

In investigating the impact of remittance receipts on agricultural asset accumulation, four key research questions were addressed. These include the following:

1. What are the factors influencing the ownership of agricultural assets in Ghana?
2. What impact does remittance receipts have on the accumulation of farmland?
3. What impact does remittance receipts have on households' livestock holding?
4. What is the impact of remittance receipts on the household accumulation of agricultural equipment?

The research questions posed above jointly assess households' asset accumulation in the context of remittance receipts. Clearly, with the exception of research question (I) which examine the factors influencing the household ownership of agricultural assets in Ghana, the remaining research questions involve an impact evaluation analysis. The impact evaluation component of this study is carried out within a counterfactual framework that focuses on the treatment effect literature. When examining the impact of an intervention, a hypothetical scenario is used that evaluates what would have been the state of asset accumulation for

households in the absence of remittance receipts. In general, the counterfactual is "hypothetical" because it is difficult to identify what the state of accumulation of household assets would be if the household does not receive remittances. Basically, methods available in addressing the research questions above make use of the hypothetical situation.

In impact evaluation, two main approaches exist; the experimental setup (randomized) and non-experimental method. The experimental approach to the impact evaluation arbitrarily selects a control group before the application of the activity, and the individuals or households belonging to this group are exempted from the intervention. Clearly, it is seen that the randomized setup is used for program intervention for which the participants can be controlled. That is, households' receipts of remittances are not activities whose impact can be assessed experimentally, "since participation is neither random nor subject to the researcher's influence" (Khandker, Koolwal, & Samad, 2010, p. 5). Hence, the non-randomized method is preferred. The non-randomized approach is associated with a series of techniques that are used in constructing the control group to assist in making comparisons with the treatment group. Among the various techniques of the non-randomized approach include propensity score matching, the double-difference method, Instrumental variables (IV) approach, regression discontinuity, and the pipeline method as well as selectivity-adjusted modelling such as the Heckman two-step estimator and the treatment effect techniques.

The first research question investigates the factors that influence the households' ownership of agricultural assets. A binary response of whether the household owns an agricultural asset or not is the dependent variable. In estimating models for which the dependent variable is dichotomous in nature, the conventional ordinary least squares (OLS), becomes less effective and efficient because it biases the results of a binary dependent variable. Thus, the Probit model

estimates the likelihood that observation with some characters will be within certain specific groups. This model uses the probit link function often assessed by the maximum likelihood method, in a probit regression, to determine the factors influencing the household ownership agricultural assets. The remaining research questions will be analyzed using the treatment effect model since evaluating the asset accumulation impacts involves a procedure where self-selection and causality are likely to occur (Angrist, 1998).

#### **4.3 Potential-outcome framework**

Impact evaluation is the study of cause-and-effect relationships. The main question asked is, "to what extent can the net difference observed in outcomes between treated and non-treated groups be attributed to the intervention, *ceteris paribus*" (Guo & Fraser, 2009, p. 21)? The potential-outcome framework in the literature is also referred to as the Rubin Causal framework or/and the Counterfactual framework (Cameron & Trivedi, 2005; Heckman, 1979; Heckman, 1997; Hirano & Imbens, 2001; Rosenbaum & Rubin, 1983; Rubin, 1974). This framework stipulates the possible outcome that each individual would obtain under each treatment level and the treatment allocation process. The potential outcome framework offers a solution to the missing data problem brought about by unobserved characteristics or uncontrolled differences inherent in observational studies due to self-selection (omitted variable bias) and causality (endogeneity).

Suppose there exist a causal effect of a binary treatment  $T_i$  on outcome  $Y_i$  for unit  $i$  ( $i = 1, \dots, N$ ). The triple  $Y_i, T_i, X_i$  is observed.  $Y_i$  is the observed outcome variable,  $T_i$  is the treatment variable,  $X_i$  is a vector of covariates that affect the outcome, and  $W_i$  is a vector of covariates that affect the treatment assignment. Both  $X_i$  and  $W_i$  may have the same elements. The counterfactual framework indicates that the observed outcome variable  $Y_i(0)$  is  $Y_0$  when  $T_i = 0$  and  $Y_i(1)$  is  $Y_1$  when  $T_i = 1$ .

Algebraically, we specify that:

$$Y_i = T_i \cdot Y_i(1) + (1 - T_i) \cdot Y_i(0) \quad (1)$$

The functional forms for  $Y_0$  and  $Y_1$  for  $T_i = 0$  and  $T_i = 1$  is:

$$Y_0 = X' \beta_0 + \epsilon_0 \quad (2)$$

$$Y_1 = X' \beta_1 + \epsilon_1 \quad (3)$$

where  $\beta_0$  and  $\beta_1$  are coefficients to be estimated, and  $\epsilon_0$  and  $\epsilon_1$  are error terms not related to  $X$  or  $W$ . This potential outcome framework splits each potential outcome into a predictive constituent  $X\beta_t$ , and an unobservable error term,  $\epsilon_t$ .

The assignment process of the treatment is:

$$T = \begin{cases} 1 & \text{if } w'\gamma + \eta > 0 \\ 0 & \text{Otherwise} \end{cases} \quad (4)$$

where  $\gamma$  is a coefficient vector and  $\eta$  is an unobservable error term that does not relate with either  $X$  or  $W$ . There are six points worth noting about the model. These are:

- I. From the framework, above, the observed data include  $Y_i, T_i, X_i$ , and  $W_i$ . The data do not reveal both  $Y_{0i}$  and  $Y_{1i}$  for any given  $i$ .
- II. The framework for  $T_i$  decides how the data on  $Y_0$  and  $Y_1$  are missing.
- III. The framework distinguishes the potential outcomes and treatment assignment into observable and unobservable constituents.

- IV. Whether  $\eta$  is autonomous of the vector  $(\epsilon_0, \epsilon_1)$  is important in specifying the set of available estimators.
- V. The coefficient vectors  $\beta_0, \beta_1$ , and  $\gamma$  are supplementary parameters used in estimating the average treatment effect (ATE), the potential means outcome (POMs) and the average treatment effect on the treated (ATET).

#### 4.3.1 Assumptions underlying the Potential-Outcome Framework

Like any type of regression models or estimators, there is the need to make some assumptions regarding the use of such a model. The usage of this framework requires making three assumptions: conditional independence (CI), the overlap assumption and, the independent and identically distributed (i.i.d.) sampling assumption.

##### The Conditional Independence (CI) Assumption

This assumption is known as unconfoundedness and/or the selection-on-observables and the ignorable treatment assignment assumption in the scientific literature (Angrist & Pischke, 2010; Cameron & Trivedi, 2005; Heckman, 1997; Lu & Tsiatis, 2006; Rosenbaum & Rubin, 1983; Imbens & Wooldridge, 2009). These terms can be used interchangeably. This assumption states that it is only the predictor variables  $X$  that can affect the treatment and the potential outcomes. And that elements that tend to affect both the treatment and the potential outcomes must not depend on one another. More generally, this assumption says that conditional on covariate  $X$ , the treatment  $T$  is independent of the vector of potential outcomes  $(Y_0, Y_1)$ . The assumption is expressed as

$$(Y_0, Y_1) \perp T|X \quad (5)$$

where  $\perp$  denotes orthogonality or independence. This assumption requires that all causes of treatment level and the outcome variable are observed.

### **The overlap assumption**

For all  $X \in \mathfrak{X}$ ,  $T$ , where  $\mathfrak{X}$  is the support of the covariates,  $0 < P_r(T = 1 | X) < 1$ .

Rosenbaum and Rubin, (1983) call this assumption the “strongly ignorable treatment assignment”. This is the amalgamation of the unconfoundedness (CI) assumption and the overlap assumption. This assumption implies that, for any setting of the covariates in the assumed population, it is highly probable to see both the control and treatment groups. This assumption ousts the likelihood that the probability score is ever zero or one. Thus, if  $P_r(T = 1 | X = X_0) = 0$ , then units with covariate values  $X_0$  will certainly not be in the treated group. The probability of treatment which is a function of covariates play an important role in estimating average treatment effects generally known as propensity score, represented by  $P_r(X) = P(T = 1 | X)$ ,  $X \in \mathfrak{X}$ . This assumption is extremely crucial in models making use of the treatment effect frameworks.

### **The independent-and-identically distributed (I.I.D) sampling assumption.**

In the potential-outcomes framework, the I.I.D sampling assumption implies that the potential outcome and treatment level of each individual is not connected to the potential outcomes and treatment statuses of all other individuals in the population. This assumption eliminates interactions among the individuals and constitutes a part of the stable unit treatment value assumption (SUTVA) according to Imbens and Wooldridge (2009) and Wooldridge (2010). Basically, SUTVA is an a priori assumption that the value of  $Y$  for unit  $i$ , when exposed to treatment  $T$ , will be the same no matter what mechanism is used to assign treatment  $T$  to unit  $i$  and no matter what treatments the other units receive and this holds for all  $i = 1, \dots, N$  and all  $T = 1, \dots, W$ .

#### 4.4 The Probit Model-Ownership of Agricultural Assets

A Probit model is a form of regression where the dependent variable is dichotomized to take on values of 0 and 1. Probit regression estimates the likelihood of an event occurring by predicting a binary dependent variable from a set of covariates. Thus, the probit model estimates the likelihood that observation with some characteristics will be between a specific group. The probit model was employed to determine the factors that influence the households' ownership of agricultural assets.

#### What are the factors influencing the ownership of Agricultural Assets in Ghana?

The probit model is used because the household asset ownership status is binary in nature that is, whether the household owns an agricultural asset or not. Factors that may influence a household ownership status will not necessarily be the same factors that may influence the household's inability to own an asset. Therefore, there are unobserved differences in the factors that influence household asset ownership. The latent or unobserved variable is represented with a linear regression model as follows:

$$Y_i^* = X_i' \beta + \mu_i \quad (6)$$

The observed is, however, an occurrence that is denoted by a dichotomous variable  $Y$ , and it is defined as:

$Y_i = 1$  if  $Y_i^* > 0$  if the household owns an agricultural asset

$Y_i = 0$  if  $Y_i^* \leq 0$  if the household does not own agricultural asset

where

$X_i'$ , is a household vector of social, economic and demographic factors;

$\mu_i$ , is an error term that is specific to each household;

$\beta$ , the vector of parameter, is common to all households.

The probability that the household owns an agricultural asset given households' social, economic and demographic characteristics is obtained as:

$$P_r(Y_{ij} = 1 | X_{ij}) = \Phi(X'_{ij}\beta) \quad (7)$$

where

$P_r$  denotes the probability;

$Y_{ij}$  represents the ownership of agricultural asset;

$\Phi$  is the Cumulative Density Function (CDF) of the Standards normal distribution;

$X'_{ij}$  denotes the vector of households' social, economic and demographic characteristics that assumed to affect the dependent variable,  $Y$ .

The coefficients obtained from the above equation represents coefficients of the index function which are partial effects. In the probit model, interpreting of the partial effects is inappropriate hence the need to compute the marginal effects for the purpose of interpretation. The computation of the marginal effects is obtained as:

$$\frac{\partial P(Y=1|X)}{\partial X_i} = \beta f(X\beta) \quad (8)$$

where  $f(.) = \frac{\partial f(.)}{\partial (X\beta)}$

#### **4.5 Analytical framework**

The treatment effect model is adopted in estimating the impact of remittance receipts on the accumulation of agricultural asset. According to Angrist (1998, p. 1), “the principal econometric problem in the estimation of treatment effects is selection bias, which arises from the fact that treated individuals differ from the non-treated for reasons other than treatment status per se”. Also Kreif, Grieve, Radice, and Sekhon (2013) point out that, estimators of the treatment effect model can reduce selection bias when the average treatment effect is estimated. A “treatment effect is, thus, the average causal effect of a binary variable on an outcome variable” implying that there is some sort of dependence between the outcome and the treatment level. Hence, treatment effects models are used as estimators to make both the treatment and outcome independent. Treatment effects models are estimated using either regression models, matching estimators, and instrumental variables to control for demographic characteristics. Angrist (1998, p. 2) notes that “the most serious econometric concern that arises in the estimation of the treatment effects is omitted variables bias brought about by selectivity bias and that the use of the potential outcome framework facilitates easy linkage between selection bias, causality and treatment effects”.

According to Heckman (1979), sample selection bias also characterizes remittance receipts. This bias associated with remittances may come about for two reasons; first, self-selection by individuals or the data units under investigation. Secondly, sample selection coming from data processors operating in the same manner as self-selection. Thus, remittances received by households, do not, in general, offer a reliable estimate of what non-remittance receiving households would have been had they received remittances. In such a scenario, household remittance status on selected samples does not, in general, estimate the population remittance function. Hence, a comparison of households that receive remittances with households that do

not receive remittances results in a biased estimate of the effect of a random "treatment" of remittances. Sample selection bias is, therefore, corrected for using the Heckman two-step estimator (Heckman, 1979). This result is, however, inserted in the appendix since it does not form part of the main work.

#### **4.5.1 Treatment Effect Model - Impact Analysis**

The treatment effect model is used for the research question that deals with impact evaluation. The impact evaluation part of the study is executed within a potential-outcome framework, already discussed above. The treatment effect method is used to estimate the effects of program intervention in observational data. This technique has been known to obtain or bring about results that are more consistent and unbiased. Usually, in studies involving the use of observational data, it is difficult for an individual to observe the treatment and control arms concurrently (Boakye-Yiadom & Lambon-Quayefio, 2017; Essilfie, 2018; Linden et al., 2016). Hence, directly comparing differences in the averages of the outcomes become problematic. Therefore, the specification of the treatment effect allows the estimation of potential means that facilitate the easy comparison between the potential mean and the average results. Relying on the approach used by Boakye-Yiadom and Lambon-Quayefio (2017), in their study on “Remittance receipts by Ghana’s households: Understanding their distribution and the impact on investment in basic education”, the household remittance receipts status is put into three main forms. That is, those that received both domestic and international remittances (overall remittances), those that received only international remittances, and those that received only domestic remittances. Such disaggregation will enable the following set of impact evaluation to be carried out:

- a) The impact of the receipts of both domestic and international remittance (overall remittance) on agricultural assets accumulation.
- b) The impact of the receipts of only international remittance on agricultural assets accumulation.
- c) The impact of the receipts of only domestic remittance on agricultural assets accumulation.

Each of the above analysis will have two sub-samples of households. That is, those that received remittances and those that did not receive any remittances at all. Boakye-Yiadom and Lambon-Quayefio (2017, p. 4) note that, “these sub-samples of households are then used to estimate remittance-recipient and remittance non-recipient agricultural asset accumulation equations. These two equations then became the basis for generating appropriate counterfactual for all the households in the sample”. After generating the counterfactuals, estimating the average impact of remittance receipts on agricultural asset accumulation is done for households that received the right kind of remittances. Treatment effects can be estimated using regression adjustment (RA), inverse-probability weights (IPW), and “doubly robust techniques”, involving inverse-probability-weighted regression adjustment (IPWRA) and the augmented inverse-probability-weights (AIPW), and through matching on the propensity score or nearest neighbors. Specifically, the average treatment effects (ATE) and the average treatment effect on the treated (ATET) are estimated.

Following Cattaneo (2010), the household remittance status, whether or not the household receives remittances, is seen as the “treatment”. The treatment effect of receiving remittances, denoted by TREAT for the household head, is written as:

$$Treat_i = Y_i(1) - Y_i(0) \quad (9)$$

Here,  $Y_i(1)$  denotes the household’s accumulation of agricultural asset if the household received remittances and  $Y_i(0)$  denotes household's accumulation of agricultural asset if the household did not receive remittances. In ensuring that there are stability and robustness of the coefficients, this research makes use of two estimators of the treatment effect model; the inverse-probability-weighting with regression adjustment (IPWRA) and the propensity score matching (PSM).

The estimated model is given as:

$$\ln \text{ Value of Agric asset}_i = \beta_0 + \beta_1 \text{Remit} + \beta_2 X_i + \epsilon_i \quad (10)$$

where, Agric asset is the main dependent variable measured by three variables: the natural log of the value of farmland, the natural log of the value of livestock and the natural log of the value of agricultural equipment. Remit, the treatment variable, is the main explanatory variable of interest, and the  $X_i$  denotes the vector of households’ social, economic and demographic characteristics which are assumed to influence the outcome,  $Y$  and  $\epsilon_i$  denotes the error term.

#### 4.5.2 Estimating Average Causal Effects

Contemporary literature on treatment effects begins with a hypothetical (counterfactual) scenario, where each individual has a result with and without treatment (Wooldridge, 2010). According to Angrist (1998), a simple comparison of those receiving treatment and those who did not can provide misleading estimates of treatment effects. The issue of selection bias inspires the use of the random assignment to estimate treatment effects in social experiments. In estimating treatment effect models, the scientific literature makes use of several possibilities. Two of these possibilities are widely used and studied. In Rosembaum and Rubin (1983), the focus is on the average treatment effect (ATE). The second possibility widely used is the average treatment effect on the treated (ATET), and only until recently that it received much attention.

The ATE is denoted as:

$$\tau_{ate} \equiv E(y_1 - y_0) \quad (11)$$

This is the effect of the treatment for a person who is randomly drawn from the population. The ATE as a measure of causal effects has been largely criticized on grounds that it is not good for policy purposes because of its ability to average across the whole population while including in the average units those who never would have qualified for the treatment.

The ATET denoted as:

$$\tau_{atet} \equiv E(y_1 - y_0 | T_i = 1) \quad (12)$$

This is the average effect for individuals who actually participated in the program.

This can also be written as:

$$E[y_1 - y_0 | T_i = 1] = E[y_1 | T_i = 1] - E[y_0 | T_i = 1] \quad (13)$$

The above expression depicts the hypothetical scenario (counterfactual nature) of a causal effect. The first part is the average effect of those who participated in the program while the second part is the average effect for individuals had they not participated in the program.

### 4.5.3. Estimation Procedure

The estimation technique employed for the study is based on two estimators of the treatment effect model. That is the IPW-RA and PSM. The description of each estimator is based largely on the empirical works of Linden et al. (2016), Kreif et al. (2013), Wooldridge (2007), Hirano and Imbens (2001), Rosebaum and Rubin (1983), Angrist (1998) and Guo and Fraser (2015).

#### **Inverse-Probability-Weighting with Regression Adjustment (IPW-RA) Estimator**

The notion behind the doubly robust (DR) estimators emerged from Robins and Rotnitzky (1995), Robins, Rotnitzky and Zhao (1995), and van der Laan and Robins (2003). Although there are several different DR methods available, the commonly used ones are attributed to Robin and his colleagues. They are called ‘doubly robust’ because they offer the researcher two ways to obtain consistent treatment effects (Linden et al., 2016). According to Linden et al. (2016), the doubly robust estimator's models both the probability of treatment and the outcome simultaneously within the same framework. A striking feature of the IPWRA estimator is that it is consistent and asymptotically normal for either a correctly specified propensity score model or a regression model. Gutman and Rubin (2017) point out that IPWRA reduces the sensitivity to model misspecification and improve precision. Wooldridge (2007) and Linden et al. (2016) point out that the IPWRA estimators attain the lower bound for the sampling variance of semiparametric estimators. Specifically, the IPWRA estimate for the average treatment effect is given as:

$$\hat{\tau}_{ate}^{IPWRA} = \frac{1}{N} \sum_{i=1}^N \frac{T_i Y_i - (T_i - e(X_i)) \mu_1(X_i, \hat{\beta}_1)}{\hat{e}(X_i)} - \frac{1}{N} \sum_{i=1}^N \frac{(1 - T_i) Y_i + (T_i - e(X_i)) \mu_0(X_i, \hat{\beta}_0)}{1 - \hat{e}(X_i)} \quad (14)$$

**Propensity Score Matching (PSM) Estimator.**

The PSM is used to correct for selection bias in observational studies. Rosembaum and Rubin (1983) were the first to propose the propensity score matching by using propensity scores attained from an initial estimation of a logit model. Because matching is inherently discontinuous in nature, the use of the estimated propensity scores complicates the matching process. According to Angrist (1998, p. 4), “unlike regression, treatment effects are constructed by matching individuals with the same covariates instead of through a linear model for the effect of the covariates”. A unique feature of the PSM is that it parameterizes the bias-correction term in the treatment probability model. Propensity score matching relies on the fact that, if conditioning on  $X_i$ , eliminates selection bias, then so does conditioning on  $P[T_i = 1|X_i]$ . And the use of the propensity scores reduces the dimensionality of the matching problem. After matching is done, the treatment effect is then estimated for each matched pair or group and averaged over the whole matched sample (Gutman & Rubin, 2015; Rubin, 2006; Imbens & Wooldridge, 2009). Matching is akin to regression in that it is inspired by the assumption that the only source of selection bias is the set of observed covariates,  $X_i$ . More formally, for each  $i$ , we ascribe values for the counterfactuals,  $y_{i0}$  and  $y_{i1}$ . If  $\hat{y}_{i0}$  and  $\hat{y}_{i1}$  represent the imputed values,  $\hat{y}_{i0} = y_i$  when  $T_i = 0$  and  $\hat{y}_{i1} = y_i$  when  $T_i = 1$ . The matching estimator will be of the form:

$$\hat{\tau}_{ate,match} = \frac{1}{N} \sum_{i=1}^N (\hat{y}_{i1} - \hat{y}_{i0}) \quad (15)$$

$$\hat{\tau}_{atet,match} = \frac{1}{N} \sum_{i=1}^N T_i (y_i - \hat{y}_{i0}) \quad (16)$$

#### **4.6 Regression Diagnostics and Post-Estimation Tests**

To ensure that estimates from the regression are robust, unbiased and consistent, post-estimation and diagnostic tests were carried out on the regression model used for the estimation. The "teffects overlap" and "tebalance" are the key diagnostics tests carried after running a treatment effect model. The "teffects overlap" provides a graphical approach to validating the overlap assumption by estimating the densities of the likelihood of obtaining each treatment level after teffects. When the overlap plots have too "much mass around 0 and 1", the assumption is violated. The "tebalance" provides statistics to assess whether a treatment effect command balanced the covariates over the treatment levels. Usually, the running of such diagnostic tests is appropriate estimators that use weights.

#### **4.7 Descriptive and summary statistics of variables**

##### **4.7.1 The variables**

The dependent variable for the study is the household agricultural asset. This is measured by three variables; the natural log of the value of farmland, the natural log of the value of livestock holding and finally, the natural log of the value of agricultural equipment when sold. In the dataset used for the study, the agricultural assets categorically specified were agricultural land, livestock/poultry/fishing, and equipment. In lieu of agricultural land, farmland was used to represent agricultural land as an asset for this study. The reason for the use of farmland rather than the agricultural land as a measure of agricultural asset was because the former provided more in-depth information. Thus, the farmland section of the dataset provided information on; ownership status of the farmland, the number of farms available, size of farms, the value of the farm when sold, the various crops grown on the farms and the cultivation manner of the farm.

In deciding what variable to use for the dependent variable, a number of variables were considered based on the works of Damon (2010), Vasco (2011) and Gonzalez-Velosa (2011). Specifically, the ownership of the agricultural asset, the number of assets available to the household and the value of the asset when sold. Issues with identifying the threshold would have been encountered had the ownership of agricultural asset been used, that is, whether or not the household owns an asset which is binary in nature. This, therefore, becomes inappropriate because it will not capture differences in the household asset composition. The number of specific assets in the household was also considered, however, a challenge of differences in value will be ignored had the number of specific assets been used. This is because there could be a household with a single asset with much value compared to another household with multiple assets of no or little value. This, therefore, encouraged the use of “value of the asset when sold” as a measure of the availability of agricultural assets in the household. So, that, if there is a monetary value attached to the asset, then the household has an agricultural asset. The natural logarithm (logarithmic transformation) of the monetary value of a particular asset was taken to cater for outliers. This, therefore, eliminated all forms of extreme values in the monetary value of the asset and as such caused the total observation for each asset value to reduce, as observed in table 4.1 below. Given that the dependent variables of interest are of a smaller sample, the descriptive statistics were based on the sample of household livestock holding since that has the highest number of observation and not on the entire population.

The explanatory variables used for the study are based on theoretical and empirical literature. These comprise household level demographic characteristics and attributes, economic characteristics, and locational variables such as ecological zones, location, and region. These explanatory variables were used differently based on the regression model being specified.

The key variable for the study is the household receipts of remittance. This is a dummy variable indicating the household remittance status. That is, whether the household receive remittance or not. With regards to the a priori expectation, the household receipts of remittance are expected to have a positive impact on various outcomes of agricultural assets. Thus, it is expected that households that receive remittances should accumulate or acquire agricultural assets of any form, whether farmland, livestock and or agricultural equipment (Bolganschi, 2011; Bohme, 2015; Davis & Lopez-Carr, 2014; Gray 2009; Wouterse & Taylor, 2008; Adams 1998).

**Table 4.1: Means and Standard deviation of variables**

<b>Variable</b>	<b>Observation</b>	<b>Mean</b>	<b>Standard Deviation</b>
Sex of Household Head-Male	7,177	0.82	0.39
Sex of Household Head-Female	7,177	0.18	0.39
Age of Household Head	7,177	48.62	15.58
Age of Household Head squared	7,177	2606.25	1661.87
Household size	7,177	5.39	3.03
Household Head-No education	7,177	0.67	0.47
Household Head-Basic education	7,177	0.09	0.29
Household Head-Secondary	7,177	0.20	0.40
Household Head-Vocational/Technical/Teacher training	7,177	0.02	0.15
Household Head-Tertiary education	7,177	0.02	0.14
Employment Status-Employed	7,177	0.93	0.26
Employment Status-Unemployed	7,177	0.07	0.26
Poverty Status-Very poor	7,177	0.16	0.37
Poverty Status-Poor	7,177	0.21	0.41
Poverty Status-Non-poor	7,177	0.63	0.48
Location-Urban	7,177	0.17	0.38
Location-Rural	7,177	0.83	0.38
Household income	7,177	7374.58	50744.16
Western region	7,177	0.07	0.26
Central region	7,177	0.05	0.23
Volta region	7,177	0.18	0.32
Eastern region	7,177	0.18	0.32
Ashanti region	7,177	0.06	0.24

Variable	Observation	Mean	Standard Deviation
Brong Ahafo region	7,177	0.11	0.31
Greater Accra	7,177	0.01	0.11
Northern region	7,177	0.16	0.37
Upper East region	7,177	0.15	0.36
Upper West region	7,177	0.14	0.35
GAMA Ecological zone	7,177	0.004	0.07
Coastal Ecological zone	7,177	0.07	0.27
Forest Ecological zone	7,177	0.37	0.48
Savannah Ecological zone	7,177	0.55	0.50
Overall remittance (Dummy)	7,177	0.37	0.48
International remittance (Dummy)	7,177	0.02	0.16
Domestic remittance (Dummy)	7,177	0.34	0.47
Log of value of livestock	7,177	6.36	1.64
Log of value of agricultural equipment	4,691	4.16	1.50
Log of value of farmland	3,935	8.16	1.70

**Source: Author's own construct from GLSS 6 data**

#### 4.7.2 Dependent Variables

Three main dependent variables were used for the study. Household farmland is a continuous variable that captures the value of the farmland when sold. The monetary value of the farmland when sold is used to represent the existence of an agricultural asset, farmland, in the household.<sup>1</sup> Again, livestock holding is also a continuous variable that captures the value of the livestock when sold. The household livestock holding involves both poultry and fish farming. The value of the asset was not given in the dataset, the researcher, therefore, calculated the monetary value of the asset by the multiplying the price at which each livestock will be sold and the quantities available in the household. This then provided the monetary value for the asset. Draught animals, such as bulls and bullocks, used purposely for pulling loads and for ploughing were excluded from the number of livestock in a household to avoid duplication

---

<sup>1</sup> The total observation for farmland is 3,935 and not on the 16,772.

with cattle. The monetary value of the livestock when sold is used to represent the existence of an agricultural asset, livestock, in the household. Finally, the value of agricultural equipment is a continuous variable that captures the value of the equipment when is sold. The monetary value of the equipment when sold is used to indicate whether the household has agricultural equipment or not. The total number of observation for agricultural equipment is 4,691.<sup>2</sup>

#### **4.7.3 Explanatory variables**

The main explanatory variable for which the impact evaluation is based on is the receipts of remittances. This is a dummy variable that captures whether the household receives remittances or not. It is coded 1 for households that receive remittances and 0 for those that did not receive remittances. Three main forms of remittance were considered for this study. Overall remittances (both international and domestic remittances), only international remittances and only domestic remittances. On average, while about 37 and 34 percent of households receive both international and domestic remittances, and only domestic remittances, only about 3 percent of households receive only international remittances.

#### **Household head characteristics**

This study is a household level study, therefore the demographic variables used are all at the household level. A household head is a person recognized by everyone in the household as making the necessary provisions for the household including the upkeep of the house. The following characteristics of the household head were employed for the study.

---

<sup>2</sup> The sample size for agricultural equipment is based on the 4,691 and not on the 16,772.

The sex of the household head is a dummy variable indicating whether the household head is a male or a female. This is coded as 1 for males and 0 for females. The descriptive statistics indicate that on average, about 82 percent of Ghanaian households headed by males has livestock compared to the 18 percent of households with livestock headed by females.

The age variable was also included in the household demographics. This captures the age of the household head. The square of the age of the household head is used to assess the possibility of non-linearity. The average age of the household head with livestock is about 49 years.

The size of the household is also a variable that captures the number of people residing or staying within a particular household. The descriptive statistics above shows that, within the Ghanaian households, the maximum number of people to be found in household is 5.

In analysis of this nature, it is expedient to include a measure of the stock of human capital within the household. The educational level of the household influences the household accumulation of agricultural assets, especially livestock. The educational level of the household is put into categories of five (5). Namely, no education, basic education, secondary education, technical and tertiary education. On average, while 67, 9 and 20 percent of household with livestock had no education, basic education and secondary education respectively, only about 2 percent of households had technical and tertiary education. This implies that about 70 percent of households with livestock had no form of education.

### **Economic characteristics**

The household income is one key household economic characteristics. This is a continuous variable that captures the household income level. This variable indicates that on average, the household income is slightly above GHc730 for households with livestock.

Another useful economic variable is the employment status of the household. This is dummy in nature and assesses whether the household head is employed or not. This is denoted 1 for employed households and 0 for unemployed households. According to the data, averagely, 93 percent of households are employed relative to the 7 percent unemployed households.

The household poverty status is a categorical variable categorized into three categories. That is, whether the household is poor, very poor and or non-poor. The descriptive statistics indicate that on average, about 63 percent of households are non-poor (rich) while 16 percent of Ghanaian households are very-poor, the remaining 21 percent of households were poor.

### **Locational variables**

The ecological zone of the household is one of the control variables that influence household asset accumulation. This is a categorical variable that captures the households' ecological location. The ecological zones available in GLSS 6 is in two forms; the ecological zone with the Accra Metropolitan Assembly (AMA) and the ecological zone with Greater Accra Metropolitan Assembly (GAMA). This study used the ecological zone with the GAMA since that covered a relatively larger and wider part of Accra. The ecological zone of households exists in four categories. Thus, whether the household is from the coastal zone, forest zone, savannah zone or from GAMA. On the average, 55 percent of households who have agricultural assets are from the savannah zone, 37 percent of households with livestock are

from the forest zone with livestock accumulation in coastal and GAMA ecological zones constituting about 4 percent each.

The place of residence of the household is a dummy variable that captures whether the household is located in urban or rural area. The data suggest that, on the average, 83 percent of households from rural areas tend to accumulate more agricultural assets specifically livestock than their counterparts from the urban centers. The average livestock accumulation for urban households is about 17 percent.

The household region of residence captures the various regions in which the households are located. According to the data, the average livestock accumulation is about 16 percent for households from the Northern region, 11, 12, 13 and 15 percent respectively for households from the Brong Ahafo, Volta and Eastern, Upper West, and Upper East regions. Again, the average livestock holding for households from the Western, Central, Ashanti and Greater Accra regions are less than 1 percent. This implies that livestock holding is common in the three northern regions of Ghana, with the Greater Accra region the least place to acquire livestock.

#### **4.8 Source of Data**

The sixth round of the Ghana Living Standards Survey (GLSS-6) is the source of the secondary data for this study. The data were collected by the Ghana Statistics Service (GSS) through a nationwide survey that focuses on the household as a key socio-economic unit and provides key information on living conditions in the country. This data was collected over a period of 12 months and contain data on complete information on the demographic characteristics of the population, education, health, employment and time use, migration and remittances, housing conditions and agriculture. Each and every wave of the GLSS focuses on something specific.

In wave 5 of the GLSS, for instance, the focus was on the Non-Farm Household Enterprises with some few aspects covering tourism, migration, and remittances. The focus of the wave 6 of the GLSS was, however, on Labor Force. The survey was a nation-wide study. This covered a representative sample of 18,000 households in 1,200 Enumeration Areas (EA). Of the 18,000 households, 16,772 were successfully listed with a response rate of 93.2 percent. All variables used for the study are obtained from the GLSS 6 data set.

The dataset also provided information on household remittances status that is vital for this study. Specifically, it makes available information on the relationship between the remitter and the household head, the sex of the remitter, whether or not the remittances will be repaid, the channels through which remittances are sent and the geographical location of the remitter. This valuable information provided by the dataset helped to reach meaningful conclusions. However, unlike the Ghana Transnational Networks (Ghana TransNet), an entity that interviews Ghanaian migrants in the Netherlands matches information from the remitter to a corresponding recipient. The GLSS 6 relied solely on the information provided by the household head. Thus, the remitter and the recipient were not paired. Again, Mazzucato et al. (2004, p. 12) points out that, "remittances from abroad mostly have spin-off effects that are not captured in the GLSS data, which may lead to an overestimation of remittances from within Ghana and underestimation of remittances from abroad".

#### 4.9 Summary

This chapter discussed the data and methodology used for the estimation of the study. The data used for the study were obtained from the sixth round of the Ghana Living Standards Survey (GLSS-6). Two main techniques were used for the estimation; the probit model and treatment effect model. The Probit model was used to examine the factors influencing the household ownership of agricultural assets, which is the first research question. The treatment effect model was used to investigate the impact of remittances on agricultural asset accumulation. This model was used because of the issue of selectivity-bias inherent in remittance studies. The treatment effect model analyzed, within the counterfactual framework, was used to estimate the potential means to facilitate easy comparison between the potential mean and the mean outcomes. Two estimators of the treatment effect model-the inverse-probability-weighting with regression adjustment (IPW-RA) and the propensity score matching (PSM)-were used for the impact evaluation. The IPW-RA was used because of its ability to model both the treatment and the outcome equation, hence the name, “doubly robust”. The PSM was also used because it has the ability to “parameterize the bias-correction term in the treatment probability model” (Stata 15, Reference manual, potential outcomes, p. 299). However, before the impact evaluation was carried out, the household remittance was put into three main forms; those that received only domestic remittances, those that received only foreign remittances, and those that received both domestic and foreign remittances (overall remittances).

## CHAPTER FIVE

### RESULTS AND DISCUSSIONS

#### 5.1 Introduction

This chapter analyzes and discusses the findings and makes inferences about the impact of remittances on the accumulation of agricultural assets in Ghana. The results are presented in the form of tables, graphs and regression analysis. This chapter has two parts. The first part considers the descriptive statistics of asset ownership for the state of remittances and the factors that influence the accumulation of assets for households in Ghana. The second part analyzes the impact of remittance receipts on agricultural assets.

#### 5.2 Descriptive statistics

**Table 5.1: Household asset ownership for remittance recipients only**

Asset ownership	Farmland	Livestock	Equipment
Owens Agricultural Asset	3,334 (58.05%)	2,651 (46.16%)	1,590 (27.69%)
Do not own Agricultural Asset	2,409 (41.95%)	3,092 (53.84%)	4,153 (72.31%)
Total	5,743 (100%)	5,743 (100%)	5,743 (100%)

**Source: Author's construct from GLSS 6 data**

In Table 5.1, the household asset ownership for remittance recipients only is presented. It can be seen that households that receive remittances and own farmland are 58.05 percent as compared to the 41.95 percent of households that receive remittances and do not own farmland. Similarly, of the total number of households that receive remittances, 46.16 percent owns livestock with the remaining 53.84 percent of household not owning livestock. Remittance recipients that own agricultural equipment are 27.69 percent compared to the 72.31 percent of households that do not own agricultural equipment. The implication of the above is that; more

than half of households that receive remittances appear not to be associated with the ownership of agricultural assets.

**Table 5.2: Household asset ownership for remittance non-recipients only**

<b>Asset ownership</b>	<b>Farmland</b>	<b>Livestock</b>	<b>Equipment</b>
Owens Agricultural Asset	6,027 (54.68%)	4,634 (42.04%)	3,101 (28.13%)
Do not own Agricultural Asset	4,995 (45.32%)	6,388 (57.96%)	7,921 (71.87%)
Total	11,022 (100%)	11,022 (100%)	11,022 (100%)

**Source: Author's construct from GLSS 6 data**

Table 5.2 shows the household asset ownership for remittance non-recipients only. It can be seen that 54.68 percent of households that do not receive remittances own farmland while 45.32 percent of remittance non-recipients own no farmland. Again, the percentage of remittance non-recipients who do not own livestock is 57.96 percent against the 42.04 percent of non-recipients who own livestock. While only 28.13 percent of households own agricultural equipment, the remaining 71.87 percent of remittance non-recipient households do not own agricultural equipment. This implies that even for households that do not receive remittances agricultural assets is scarcely owned. Thus, remittance non-receiving households seem not to be associated with the acquisition of agricultural assets.

### **5.3 Factors influencing the household ownership of agricultural asset**

The section focuses on the factors influencing the household ownership of agricultural assets in Ghana. Post-estimation tests like the linktest (see Appendix) was conducted to test for model specification. As Chen, Hua, Reifman, and Cheng (2003) indicate, for a model to be correctly specified, the scores for  $\hat{u}_i^2$  must be insignificant regardless of the scores  $\hat{u}_i$  takes. The linktest scores (see Appendix) show that across all three measures of agricultural assets, the

\_hat is significant while the \_hatsq is insignificant. This implies that all three models of agricultural assets were correctly specified hence there was no problem of model misspecification. With regards to the explanatory power of the covariates, values of the Pseudo R-squared ( $R^2$ ) suggests that the covariates fairly explain household asset ownership. Thus, values of 0.4625, 0.3472 and 0.2922 respectively were observed for farmland, livestock and agricultural equipment. Indicating that, 46, 35 and 29 percent of the variations in farmland, livestock and agricultural equipment, was explained by the covariates respectively.

The sex of the household plays a very important role in determining the household acquisition of assets. The study finds that households headed by males, relative to females, are more likely to own an agricultural asset than their counterpart female-headed households. Thus, the acquisition of farmland, livestock holding and agricultural equipment increases by 8, 10 and 13 percentage points respectively for households headed by males than for female-headed households. Consistent with this result is the study of Chiodi et al. (2012) who observed that households headed by males significantly increase asset accumulation, this variable is statistically significant at 1 percent.

As the household head advances in age, he is more likely to acquire agricultural assets in the form of farmland, livestock and agricultural equipment by 1.3, 4 and 1.1 percentage points respectively. A positive and significant relationship, therefore, exists between the household asset ownership and the age of the household head. However, the age square of the household head is negative. Thus, as the male-headed household continues to acquire agricultural assets, there comes a point where he is unable to accumulate these assets because he is aging so the household asset ownership is likely to decline. As a result, a quasi-linear relationship emerges between the age of the household head and agricultural asset accumulation. This is in

consonance with the study of Piras et al. (2018) who found that the age of the household head influences the acquisition of farmland for farming activities. Similarly, Vasco (2011) observed that the age square reduces the probability of the household acquiring cattle by 1 percent.

From the results obtained in Table 5.3, the size of the household positively influences asset accumulation by 2 percent each for farmland and agricultural equipment, and 3 percent for livestock holding. This is significant at 1 percent. This suggests that the larger the size of the household, the easier it becomes to own a land and/or farmland for farming activities, also labor becomes abundant for livestock production and agricultural equipment usage. In line with this finding is the empirical study of Damon (2010). Damon (2010) found that the size of the household increases the household land ownership for basic grains production by 2 percentage points. Similar finding emerged from the empirical study of Chiodi et al. (2012). Thus, larger household size is needed to own and to operate an agricultural asset.

Further, the educational level of the household plays a vital role in determining the factors that influence the accumulation of agricultural assets. Concerning the educational level, Table 5.3 shows significant results, at 1 percent. Using tertiary education as the base, it can be seen that, across all three outcomes of agricultural assets, households with no education, basic education, secondary and vocational/technical education are more likely to own agricultural assets than their counterpart households who have acquired tertiary education. Estimates from Agricultural Facts and Figures (2016) indicate that agriculture is predominantly engaged by poor households whose livelihood strategy is dependent on agriculture. Thus, according to the Food and Agriculture Organization (FAO, 2014), many youths, especially graduates, do not consider agriculture as a viable or attractive means of earning a living, so they do not venture into agricultural activities. Also, with regards to households with no education, the likelihood of

the household owning farmland, livestock and agricultural equipment increases by 20, 14 and 12 percentage points respectively. Again, the probability of acquiring farmland, livestock and agricultural equipment for households with basic education increases by 15 percent and 8 percent respectively. Similarly, households with secondary education are associated with a higher probability of owning farmland, livestock and agricultural equipment. The likelihood for asset ownership increases by 14, 8, and 9 percentage points respectively. Finally, households with vocational and/or technical education increases the likelihood of acquiring farmland, livestock and agricultural equipment by 7, 3 and 5 percent respectively. Consistent with this finding is that of Bohme (2015), Damon (2010) and Vasco (2011).

The employment status of the household influences the household ownership of agricultural assets. Using employed households as the base reference, households who are unemployed have a negative relationship with the acquisition of agricultural assets. That is, unemployed households are less likely to own farmland, livestock and agricultural equipment relative to households who are gainfully employed. This leads to a decline in asset acquisition by 22 percent for farmland, and 10 percent respectively for livestock holding and agricultural equipment. This is statistically significant at 1 percent.

The poverty status of the household significantly influences the household asset accumulation status. Using non-poor households as the base reference, households who are very-poor are more likely to own farmland than their counterpart who are not poor. This is statistically significant at 1 percent. That is, very-poor households tend to own and operate farmland on a small scale for subsistence purposes. Evidence from Agricultural Facts and Figures (2016) indicates that farming activities in Ghana are usually on a small scale because it is practiced predominantly by poor households whose subsistence and livelihood depend on farming.

Similarly, households who are very-poor are negatively related with the ownership of agricultural assets. Thus, very-poor households are less likely to own livestock and to commence livestock production relative to wealthy households. The likelihood of acquiring livestock reduces by 8 percent for very poor households. Again, very poor households are less likely to own agricultural equipment than their wealthy counterparts, the percentage decrease in household asset ownership is 6 percent. With regards to poor households, while the likelihood of owning farmland increases by 5 percent, the likelihood of livestock holding and agricultural equipment decreases by 3 percent each respectively. This implies that relative to non-poor households, poor households are less likely to own livestock and acquire equipment for production. They are however more likely to own farmland since their livelihood depends on it.

Household income has a negative relationship with the ownership of agricultural assets in Ghana. This means that a household that experiences a GHC 1.00 increase in the income level is less likely to own any agricultural assets. While this variable is significant at 1 percent in determining the household ownership of farmland, it is, however, not significant for livestock production and agricultural equipment. Consistent with this finding is that of Bohme (2015). He observed that other incomes and credit to the household do not significantly influence livestock accumulation. Contrary to this Vasco (2011) found that the availability of credit to the household has a positive impact in determining the household acquisition of cattle.

Using Greater Accra Metropolitan Area (GAMA) as the base reference for the ecological zone, the ownership of farmland, livestock and agricultural equipment by the household increases by 3, 11, and 10 percentage points respectively for households from the coastal ecological zone. However, the household ownership of farmland from the coastal ecological zone is not

significant. This means that farmland ownership is less likely to occur in the coastal zone of Ghana. A notable reason for such an occurrence is because the main occupation of households from the coastal zone is fishing rather than farming. The coastal zone is, however, more likely to influence the household ownership of livestock and agricultural equipment. This is significant at 1 percent. Again, relative to GAMA, agricultural asset ownership is predominant in the forest ecological zone. Thus, agricultural assets are more likely to be owned in forest areas than in GAMA. Forest ecological zone increases the household asset ownership by 18, 16, and 22 percentage points respectively for farmland, livestock holding, and agricultural equipment. This variable has a significant effect on agricultural assets. Finally, households' asset ownership is very likely to occur in savannah ecological zones than in GAMA. Thus, the savannah ecological zone increases the household asset ownership by 19, 20, and 19 percent for farmland, livestock and agricultural equipment respectively. This is also statistically significant at 1 percent. This study is in consonance with Gray (2009) who observed that forest areas which typically have black and loamy soils are favorable lands for the production of crops. He further notes that savannah areas with low lying lands are not significant determinants of the use of agricultural equipment which, however, goes contrary to the one observed in the study.

The location of the household has a positive and significant effect on the household ownership of agricultural assets. Using households from urban areas as the base reference, households from rural areas are more likely to acquire any kind of agricultural asset. Thus, the likelihood of owning farmland, livestock and agricultural equipment increase by 33, 25 and 18 percent respectively for households from rural areas than their counterparts from urban centers. This is because, agricultural activities are not predominant in the urban centers but rather in rural areas, hence the likelihood of rural areas owning more agricultural assets.

Using Greater Accra as the base reference, households from the Western, Volta, Brong-Ahafo, Upper East, and Upper West regions are more likely to acquire agricultural assets of any kind relative to households from Greater Accra. These are significant at 1 percent. Similarly, while residence in the Central and Ashanti region significantly influences the household asset ownership by 15 and 16 percent respectively, households from the Eastern and Northern regions are associated with an increased probability of owning farmland and livestock. This is statistically significant at 1 percent.

**Table 5.3: A Probit model for the ownership of agricultural assets**

Variables	(1) Farmland	Marginal effects	(2) Livestock	Marginal effects	(3) Equipment	Marginal effects
Sex of household head (Base-Female)						
Head-Male	0.396***	0.084***	0.410***	0.096***	0.640***	0.131***
	(0.040)	(0.008)	(0.036)	(0.008)	(0.041)	(0.008)
Head-age	0.061***	0.013***	0.044***	0.010***	0.053***	0.011***
	(0.006)	(0.001)	(0.006)	(0.001)	(0.006)	(0.001)
Head-age square	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household size	0.087***	0.018***	0.130***	0.030***	0.080***	0.017***
	(0.008)	(0.002)	(0.007)	(0.002)	(0.006)	(0.001)
Household educational level (Base-Tertiary)						
Head-No education	0.931***	0.201***	0.594***	0.137***	0.625***	0.122***
	(0.086)	(0.018)	(0.087)	(0.018)	(0.094)	(0.015)
Head-Basic	0.683***	0.147***	0.363***	0.081***	0.428***	0.079***
	(0.092)	(0.019)	(0.093)	(0.020)	(0.100)	(0.017)
Head-Secondary	0.636***	0.137***	0.360***	0.080***	0.473***	0.088***
	(0.086)	(0.018)	(0.089)	(0.019)	(0.094)	(0.015)
Head-Vocational/Technical/Teacher training	0.337***	0.072***	0.116	0.025	0.273**	0.048**
	(0.113)	(0.024)	(0.113)	(0.024)	(0.116)	(0.020)
Employment status (Base-Employed)						
Unemployed	-1.058***	-0.221***	-0.409***	-0.092***	-0.486***	-0.095***
	(0.070)	(0.013)	(0.058)	(0.012)	(0.066)	(0.011)
Poverty status (Base-Non-poor)						
Very poor	0.214***	0.045***	-0.336***	-0.075***	-0.274***	-0.056***
	(0.076)	(0.016)	(0.059)	(0.012)	(0.056)	(0.011)

Variables	(1)		(2)		(3)	
	Farmland	Marginal effects	Livestock	Marginal effects	Equipment	Marginal effects
Poor	0.218***	0.046***	-0.107**	-0.025**	-0.138***	-0.029***
	(0.053)	(0.011)	(0.043)	(0.010)	(0.042)	(0.009)
Household income	-0.000*	-0.000*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ecological zone (Base-GAMA)						
Coastal Ecological zone	0.114	0.024	0.530***	0.114***	0.789***	0.098***
	(0.169)	(0.036)	(0.144)	(0.028)	(0.204)	(0.017)
Forest Ecological zone	0.801***	0.179***	0.693***	0.155***	1.340***	0.216***
	(0.178)	(0.040)	(0.154)	(0.031)	(0.214)	(0.020)
Savannah Ecological zone	0.836***	0.187***	0.869***	0.201***	1.227***	0.189***
	(0.187)	(0.043)	(0.163)	(0.035)	(0.219)	(0.022)
Location (Base-Urban)						
Rural	1.267***	0.328***	0.953***	0.252***	0.797***	0.177***
	(0.034)	(0.010)	(0.034)	(0.009)	(0.035)	(0.008)
Region (Base-Greater Accra)						
Western Region	0.766***	0.171***	0.222*	0.052*	0.469***	0.104***
	(0.145)	(0.032)	(0.120)	(0.027)	(0.127)	(0.026)
Central Region	0.674***	0.149***	0.118	0.027	-0.222	-0.040
	(0.147)	(0.032)	(0.123)	(0.027)	(0.141)	(0.026)
Volta Region	1.126***	0.256***	0.831***	0.213***	0.556***	0.126***
	(0.144)	(0.034)	(0.118)	(0.029)	(0.127)	(0.026)
Eastern Region	0.925***	0.208***	0.699***	0.176***	0.105	0.021
	(0.151)	(0.034)	(0.124)	(0.030)	(0.134)	(0.026)
Ashanti Region	0.700***	0.156***	0.061	0.014	0.051	0.010
	(0.150)	(0.033)	(0.126)	(0.028)	(0.135)	(0.026)
Brong-Ahafo Region	1.247***	0.284***	0.624***	0.155***	1.098***	0.272***
	(0.153)	(0.036)	(0.127)	(0.031)	(0.136)	(0.030)
Northern Region	1.095***	0.248***	0.783***	0.199***	0.048	0.009
	(0.164)	(0.038)	(0.136)	(0.034)	(0.144)	(0.028)
Upper East Region	1.512***	0.346***	1.187***	0.313***	0.248*	0.052*
	(0.170)	(0.041)	(0.138)	(0.036)	(0.144)	(0.029)
Upper West Region	1.211***	0.276***	0.771***	0.196***	0.550***	0.124***
	(0.165)	(0.039)	(0.137)	(0.034)	(0.144)	(0.031)
Constant	-5.295***		-4.470***		-5.350***	
	(0.209)		(0.189)		(0.264)	
Observations	16,772	16,772	16,772	16,772	16,772	16,772
Pseudo $R^2$	0.4625		0.3472		0.2922	
Prob>Chi2	0.000		0.000		0.000	
Robust Standards errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Source: Author's construct from GLSS 6 data

#### 5.4 The Impact of Remittance Receipts on Agricultural Asset Accumulation

This section of results discussion and analysis deal with the impact of remittances on agricultural asset accumulation in Ghana. The treatment effect estimation shows the actual relationship between receiving remittances and the accumulation of agricultural assets. These estimations account for the possible selectivity bias that may exist between remittance receipts and the household asset accumulation. Two estimators of treatment effect model are used; inverse-probability-weighting with regression adjustment (IPW-RA) and Propensity score matching (PSM). For each of these estimators, the average treatment effect (ATE) and the average treatment effect on the treated (ATET) are estimated

##### 5.4.1 The Impact of the Receipts of both International and Domestic Remittance (Overall remittance) on Agricultural Assets

**Table 5.4: Receipts of overall remittance on farmland**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.029 (0.054)	-0.017 (0.068)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	0.027 (0.065)	0.121 (0.083)
Observation	3,935	3,935
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

From Table 5.4, the impact of the receipts of overall remittance on farmland is estimated. The coefficients indicating the effect of overall remittances on farmland accumulation as well as the standard errors (in parentheses) are also presented. Across both estimators, the results indicate that after even controlling for the possibility of selection bias, whether or not the

household receives both international and domestic remittance does not significantly affect their accumulation of farmland.

**Table 5.5: Receipts of overall remittance on livestock holding**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.123*** (0.037)	-0.132*** (0.047)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.118*** (0.038)	-0.176*** (0.057)
Observation	7,177	7,177
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

Table 5.5 presents the impact of the receipts of both International and domestic remittances on household livestock holding. The table shows the coefficients as well as the standard errors (in parentheses) for the effect of overall remittances on the household livestock holding. The receipts of overall remittances significantly affect the household accumulation of livestock, although a negative impact is observed. In estimating the average treatment effect (ATE) for IPWRA and PSM, the results suggest that, on average, households that receive both International and domestic remittances reduce the value of livestock by 12.3 and 13.2 percent respectively compared to households that do not receive remittances. The average treatment effect on the treated (ATET) for the IPWRA and PSM also indicates that, on average, the value of livestock decreases by 11.8 and 17.6 percentage points respectively for households that receive both International and domestic remittances compared to households that do not receive remittance. This result is in consonance with the findings of Piras et al. (2018) who found that remittances negatively impact on livestock production, specifically, dairy cattle production. They point out that, because the household may find itself in a “poverty trap”, the receipts of

overall remittances may only be used for consumption purposes and not for investing in livestock holding hence overall remittances do not enhance the household accumulation of livestock.

**Table 5.6: Receipts of overall remittance on agricultural equipment**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.268*** (0.043)	-0.296*** (0.051)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.276*** (0.044)	-0.414*** (0.066)
Observation	4,691	4,691
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

In Table 5.6, the impact of the receipts of overall remittances on agricultural equipment is estimated where the coefficients, as well as the standard errors (in parentheses) of the effect of overall remittances on the household accumulation of agricultural equipment are displayed. The results indicate that after controlling for the possibility of selection bias, whether or not the household receives both international and domestic remittance significantly affect the accumulation of agricultural equipment. The results of the average treatment effect (ATE) for IPWRA and PSM suggest that, on average, households that receive both international and domestic remittances reduce the value of agricultural equipment by 26.8 and 29.6 percent respectively compared to households that do not receive remittances. Similarly, results of the average treatment effect on the treated (ATET) for the IPWRA and PSM also indicate that, on average, the value of agricultural equipment decreases by 27.6 and 41.4 percent for households that receive remittances compared to households that do not receive remittances respectively. This means that, because the receipts of remittance reduce the value of agricultural equipment,

the household accumulation of agricultural equipment has declined. Hence a diminution in agricultural equipment. This is also in line with Piras et al. (2018) who investigated the effect of remittances inflow on agricultural machinery. They, however, found a negative effect of remittance inflow on agricultural machinery.

#### 5.4.2 The Impact of the Receipts of Only International Remittance on Agricultural Assets

**Table 5.7: Receipts of only international remittance on farmland**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	0.287* (0.164)	0.271* (0.160)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	0.184 (0.153)	0.368* (0.208)
Observation	3,935	3,935
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

Table 5.7 presents the impact of the receipts of only international remittances on farmland. It shows the coefficients as well as the standard errors (in parentheses) of the effect of only international remittances on the household accumulation of farmland. In estimating the average treatment effect (ATE) for IPWRA and PSM, the results suggest that, on average, households that receive only international remittances increases the value of the farmland by 28.7 and 27.1 percent respectively compared to households that do not receive remittances. The results for the estimates of the ATE for the IPWRA and PSM are significant at 10 percent significance level even after controlling for the possibility of selection bias. The average treatment effect on the treated (ATET) for the IPWRA and PSM also indicates that, on average, the value of farmland increase by 18.4 and 36.8 percent for households that receive remittances compared

to households that do not receive remittances respectively. While the ATET for the PSM is significant at 10 percent, the ATET for the IPWRA is not significant. This means that the receipt of international remittances increases the value of the farmland since it results in an improvement in the farmland, hence more farmland is accumulated by the household. Consistent with this study is the empirical work of Aguilar-Støen et al. (2016), Gray (2009) Böhme (2015), Davis and Lopez-Carr (2014) who found that the receipts of only international remittances are used by the household in accumulating agricultural land and farmland since households will rely on farming for their daily consumption, they will be willing to accumulate farmland in the wake of remittances for crop production. Contrary results were observed by Damon (2010), Jokischl (2002), Wouterse and Taylor (2008), and Piras et al. (2018) who indicated that because the household is in vicious cycle of poverty, remittances are channeled towards consumption and not for investing in farmland. Hence the receipts of only international remittances have no impact on the household farmland acquisition.

**Table 5.8: Receipts of only international remittance on livestock holding**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	0.302* (0.181)	0.655*** (0.234)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	0.164* (0.120)	0.090*** (0.144)
Observation	7,177	7,177
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

In Table 5.8, the impact of the receipts of only international remittances on livestock holding is estimated where the coefficients, as well as the standard errors (in parentheses) of the effect of only international remittances on the household holding of livestock is presented. The results

indicate that after controlling for the possibility of selection bias, whether or not the household receives international remittance significantly affect the accumulation of livestock at 10 and 1 percent for the IPWRA and PSM respectively. The average treatment effect (ATE) for IPWRA and PSM, suggests that, on average, households that receive international remittances increase the value of livestock by 30.2 and 65.5 percent respectively compared to households that do not receive remittances. Results of the average treatment effect on the treated (ATET) for the IPWRA and PSM also indicate that, on average, households that receive only international remittances increase the value of livestock by 16.4 and 9 percent respectively compared to households that do not receive remittances. This means that the receipts of only international remittances increase the value of livestock since it results in an improvement in the livestock holding, hence more livestock is accumulated by the household. This finding is in consonance with McCarthy et al. (2006), Wouterse and Taylor (2008), and Miluka et al. (2007) who indicated that international remittances from migrants stimulate livestock accumulation. Wouterse and Taylor (2008) argues that the positive effect of international remittances on the accumulation of livestock indicates that international remittances enable the household to overcome barriers in the accumulation of livestock due to missing and imperfect credit markets. Contrary results were observed by Böhme (2015), Damon (2010), Jokischl (2002), Piras et al. (2018), Davis and Lopez-Carr (2014) and Vasco (2011) who indicate that international remittances have no impact on the household accumulation of livestock.

**Table 5.9: Receipts of only international remittance on agricultural equipment**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.358*** (0.107)	-0.451*** (0.117)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.400*** (0.109)	-0.407*** (0.149)
Observation	4,691	4,691
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

In Table 5.9, the impact of the receipts of only international remittances on agricultural equipment is estimated. The table shows the coefficients as well as the standard errors (in parentheses) of the effect of only international remittances on the household accumulation of agricultural equipment. The results indicate that after controlling for the possibility of selection bias, whether or not the household receives international remittance significantly affect the accumulation of agricultural equipment. The results of the average treatment effect (ATE) for IPWRA and PSM suggest that, on average, households that receive only international remittances reduce the value of agricultural equipment by 35.8 and 45.1 percent respectively compared to households that do not receive remittances. Similarly, results of the average treatment effect on the treated (ATET) for the IPWRA and PSM also indicate that, on average, the value of agricultural equipment decreases by 40 and 40.7 percentage points for households that receive remittances compared to households that do not receive remittances. This means that, because the receipts of remittance reduce the value of agricultural equipment, the household accumulation of agricultural equipment has declined since remittances do not lead to enhancement in agricultural equipment. The negative effect realized implies that remittances are not used for investing in agricultural equipment. This is in line with studies by Bolganschi (2011), Damon (2010), and Jokischl (2002) who observed that remittance receipts from

migrants abroad do not translate into the accumulation of agricultural equipment since they are used largely for education, health and largely for conspicuous consumption. Contrary to the above finding are the studies by Böhme (2015) and Mendola (2008) who indicated that households who are able to engage in costly migration are more likely to acquire modern equipment for agricultural purposes through the use of remittances which helps overcome liquidity constraint for subsistence production than their counterparts who are not.

### 5.4.3 The Impact of the Receipts of Only Domestic Remittance on Agricultural Assets

From Table 5.10, the impact of the receipts of only domestic remittances on farmland is assessed. The table displays the coefficients, as well as the standard errors of the effect of the receipts of remittance on the accumulation of farmland. The results indicate that after controlling for the possibility of selection bias, whether or not the household receives only domestic remittance does not significantly affect the accumulation of farmland.

**Table 5.10: Receipts of only domestic remittance on farmland**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.043 (0.055)	-0.017 (0.066)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.0378 (0.583)	-0.031 (0.079)
Observation	3,935	3,935
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

**Table 5.11: Receipts of only domestic remittance on livestock holding**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.148*** (0.038)	-0.166*** (0.047)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.140*** (0.038)	-0.191*** (0.054)
Observation	7,177	7,177
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

In Table 5.11, the coefficients, as well as the standard errors (in parentheses) are presented indicating the impact of the receipts of only domestic remittances on the household livestock holding. Estimates of the IPWRA and PSM suggest that domestic remittances significantly influence livestock accumulation at 1 percent. There is, however, a negative relationship between the receipts of only domestic remittances and livestock holding. The estimated average treatment effect (ATE) for IPWRA and PSM suggests that when all households receive domestic remittances, the average value of farmland reduces by 14.8 and 16.6 percentage points relative to a household that does not receive remittances. Also, results of the average treatment effect on the treated (ATET) for the IPWRA and PSM indicate that, on average, the value of farmland decreases by 14 and 19.1 percent respectively for households that receive remittances compared to households that do not receive remittances. This means that the receipts of only domestic remittance reduce the value of livestock since remittances do not enhance the household accumulation of livestock. This is in line with Wouterse and Taylor (2008) who found no effect of domestic remittances on livestock accumulation. The authors indicate that, the receipts of only domestic remittances are not large enough to help the household overcome household credit constraints due to imperfect credit markets. This therefore makes it difficult for the household to invest productively into livestock.

Table 5.12 shows the results of the impact of the receipts of only domestic remittances on the households' accumulation of agricultural equipment. The table shows the coefficients and the standard errors (in parentheses) of the impact of only domestic remittances on the households' accumulation of agricultural equipment. The results of the IPWRA and PSM suggest that domestic remittances significantly influence the accumulation of agricultural equipment at 1 percent. There is, however, a negative relationship between the receipts of domestic remittances and agricultural equipment. The estimated average treatment effect (ATE) for IPWRA and PSM suggests that for all households that receive only domestic remittances, the average value of agricultural equipment reduces by 24.5 and 23.7 percent respectively. Also, results of the average treatment effect on the treated (ATET) for the IPWRA and PSM also indicate that, on average, the value of agricultural equipment decreases by 26.3 and 19.6 percentage points for households that receive remittances compared to households that do not receive remittances. This means that the receipts of only domestic remittances reduce the value of agricultural equipment since remittances do not enhance the household accumulation of agricultural equipment. Consistent with this study is that of Mendola (2008), who observed that domestic remittances have no impact on agricultural technology since poor households find it difficult to overcome the entry costs of migrating to advanced countries and as such their inability to receive remittances.

**Table 5.12: Receipts of only domestic remittance on agricultural equipment**

	Treatment effect estimators	
	IPWRA	PSM
<i>Average treatment effect (ATE)</i>		
Households that receive versus Households that do not receive	-0.245*** (0.043)	-0.237*** (0.055)
<i>Average treatment effect on the treated (ATET)</i>		
Households that receive versus Households that do not receive	-0.263*** (0.443)	-0.196*** (0.051)
Observation	4,691	4,691
Robust Standards errors in parentheses. *p<0.1; **p<0.05; ***p<0.01		

**Source: Author's construct from GLSS 6 data**

### 5.5 Testing for overlap plots and balancing of covariates

The overlap assumption indicates that each individual has a positive probability of receiving each level of treatment. This graph is used to authenticate the validity of the overlap assumption. The overlap plot was made for the three main forms of remittance receipts (overall remittances, only international remittances and only domestic remittances). None of the graphs (see appendix) indicates a probability mass close to 0 or 1, and the two estimated densities have the majority of their respective masses in regions where they overlap each other. This implies that the assumption of overlap has not been violated.

Also, covariate balance was tested for. Basically, the “teffects balance” is used for checking for the balance in covariates. Table A12, see appendix, shows the unadjusted pre-treatment characteristics of households in the two treatment arms (treated and control). The absolute Standardized difference is used to evaluate the balance of covariates (Linden & Samuels, 2013). It is observed that many of the absolute Standardized mean differences are significantly greater than zero, which is optimal, and four (4) of the eleven (11) absolute Standardized mean differences are greater than the limit of 0.25 recommended by Rubin (2001). Once the absolute

Standardized difference is greater than the 0.25 cut, then the covariates are not balanced. This, therefore, requires weighting the unadjusted pre-participation characteristics of remittance recipients and non-remittance recipients as presented in Table A13.

In Table A13, see appendix, the pre-treatment characteristics of the households after weighting is presented. It is, therefore, observed that all the absolute Standardized difference are now much closer to zero (Linden & Samuels, 2013), and no value is greater than 0.25. This, therefore, suggest that the covariates balance the data. At this point, the covariates are balanced.

## CHAPTER SIX

### SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

#### 6.1 Introduction

This chapter deals with the summary of the main findings and conclusions of the study. Policy recommendations regarding remittance receipts are discussed for possible consideration and future investigation. This is followed by the limitations of the study.

#### 6.2 Major findings of the study

The objectives of the study which are; to examine the extent to which remittance receipts affect the household accumulation of farmland, livestock holding and agricultural equipment, were carried out using two estimators of treatment effect model. Specifically, the IPWRA and PSM were used to estimate the average treatment effect (ATE) and the average treatment effect on the treated (ATET). The study sought to evaluate the impact of remittances on the accumulation of farmland, livestock holding as well as agricultural equipment.

In examining the extent to which remittance receipts affect the household accumulation of farmland, the study found that while the receipts of overall remittances (both international and domestic) and only domestic remittance do not facilitate the accumulation of farmland, the receipts of only international remittances significantly increases the household's accumulation of farmland. The receipts of overall remittances and only domestic remittance are negatively related to farmland accumulation, although they are significant. On the whole, households that receive only international remittances tend to accumulate more farmland than their counterparts that receive only domestic remittance and/or overall remittance. Thus, households see investing in farmland as a livelihood strategy against poverty.

Again, in assessing the influence that remittance receipts have on household livestock holding, the results showed that the receipts of overall remittances, only international remittances, and only domestic remittances significantly impact on livestock accumulation. However, while the receipts of only international remittances positively impact on livestock accumulation, the receipts of overall remittances and only domestic remittances negatively affect livestock accumulation. This implies that the receipts of international remittances play an essential role in the household livestock accumulation. More formally, the receipts of international remittances lead to an enhancement in livestock accumulation since livestock accumulation is seen as a risk buffer to most rural households (Dercon, 1998).

Finally, in investigating the impact of remittance receipts on the household accumulation of agricultural equipment, the study found that the receipts of remittances (of any kind) significantly impact on agricultural equipment accumulation. This, however, leads to a decrease in the accumulation of agricultural equipment. This implies that the receipts of remittances do not result in an enhancement in agricultural equipment since household do not use remittances for the acquisition of agricultural equipment.

The probit regression estimation technique was used to achieve the first objective of finding out the factors that determine the household ownership of agricultural assets in Ghana. The results obtained from the probit regression suggest that male-headed households possess unique characteristics that significantly influence the household ownership of agricultural assets. They are therefore more likely to acquire agricultural assets of any kind. Although the age of the head of the household significantly influences asset ownership as the head ages, the likelihood of asset accumulation for the household declines. Again, the size of the household and the educational level of the household head plays a significant role in asset accumulation.

Both the size of the household and educational level of the household increases the likelihood of asset ownership.

While the income level of the household influences the accumulation of farmland, it has a negative and insignificant effect on livestock holding and agricultural equipment. Similarly, unemployed households were less likely to own agricultural asset in Ghana. Relative to non-poor households, poor and very-poor households were less likely to own livestock and agricultural equipment but more likely to own farmland.

Urban households exhibited less likelihood of owning any form of agricultural asset compared to rural households. Also, households from coastal ecological zones are more likely to acquire livestock and agricultural equipment but not farmland since majority are involved in fishing activities compared to those from GAMA. Likewise, households from savannah and forest ecological zones are more likely to acquire any kind of agricultural asset relative to those from GAMA. Again, region plays a significant role in the household ownership of an agricultural asset.

### **6.3 Conclusion**

Despite the large literature on the developmental effects of remittances, the relationship between remittances and productive investment, specifically agricultural asset accumulation, have not been fully explored. The limited literature that has concentrated more on Latin America and Caribbean countries display conflicting results. Within the sub-Saharan region, there is a paucity of studies on remittances and agricultural asset accumulation. This, therefore, necessitated the need to investigate the relationships within the Ghanaian context.

The study found that, in general, the receipts of remittances play a significant role in the household accumulation of agricultural assets in Ghana. It was observed that the receipts of only international remittances enable the household to accumulate livestock and farmland and not agricultural equipment while the receipts of overall remittances and only domestic remittances does not affect the accumulation of any kind of agricultural asset. Also, the study finds that, except unemployed households, households who are poor and very-poor, and the household income, which reduces the likelihood of acquiring agricultural assets, all other variables increases the likelihood of acquiring agricultural assets in Ghana.

Overall, the receipts of remittances do not have a positive impact on the accumulation of agricultural assets although they are significant in predicting household asset accumulation. However, the receipts of only international remittances positively impact on farmland and livestock holding but not on agricultural equipment. These findings align with the studies by Bolganschi (2011), Bohme (2015), Davis and Lopez-Carr (2014), Gray (2009), and Wouterse and Taylor, (2008).

#### **6.4 Policy recommendation**

Considering the findings, summary, and conclusion of the study, the following policy recommendations are advocated.

Given the significant and positive effect of the receipts of only international remittances, the Central Bank needs to create a conducive institutional environment and legal system that will facilitate the receipts of international remittances. This can be done by strengthening the point of remittance transfer (such as commercial banks, money transfer companies, and collection agencies) and the network linkage (SWIFT, telegraphic transfers, and telephonic messages).

This will facilitate the easy and fast flow of remittances. Additionally, the Central Bank must design a regulatory framework that will integrate all informal means of sending remittances to Ghana into the formal channel because of the large amount of international remittances received.

Even though the study did not examine the cost dimension to the receipt of remittances, it will be expedient to consider the cost associated with the transfer of remittances. Usually, the cost of sending remittances through formal channels is high compared to the informal channel. The Central Bank could work to reduce the high cost of sending remittances which will encourage both migrants and non-migrants to send remittances. This can be done by facilitating the creation of more money transfer agencies that would promote competition thereby reducing significantly the high cost of sending remittances. A reduced cost of sending remittances will imply a greater impact on household asset accumulation. This then will encourage the use of formal remittance channels.

Concerning remittance and agricultural assets, since international remittance was found to significantly impact investment in farmland and livestock accumulation of the household, there is the need for a supportive business environment. That is, policymakers through the Ministry of Food and Agriculture and other stakeholders should pay attention to removing all obstacles that may prevent remittance recipient households from investing in agriculture, specifically through the accumulation of farmland and livestock.

### **6.5 Limitations of the study**

Even though a current version of the GLSS dataset is in existence, the GLSS 7 dataset could not be used for this study since the construction of the remittance section ignored some variables important for the analysis in this study. This study, therefore, relied on GLSS 6 for its analysis. Again, the GLSS dataset used had limited information on remittances hence, a hindrance to an in-depth study on remittances. Thus, GLSS 6 relied mostly on information provided by the household, without pairing the remitter to the household head as is the case with the GhanaTransNet dataset. This dataset was, however, not used because it does not ask questions about the household agricultural asset accumulation status although it had rich information with regards to remittances. Further, the initial measurement of agricultural asset by GLSS 6 posed a lot of challenges. This is because agricultural land as a measure of agricultural asset had limited information with regards to size of agricultural land, the number of agricultural land owned, and the value of agricultural land when sold. These could have been used for a meaningful analysis but because they were completely not in the dataset, farmland was used as a proxy for agricultural asset instead of agricultural land.

### **6.6 Suggestions for Future Studies**

This study recommends that future research should use a panel dataset for a study of this nature since household asset accumulation does not occur at a point in time. Further, future research could consider integrating migration studies into such a study to examine the impact of both migration and remittances on the household asset accumulation status.

## REFERENCES

- Acosta, P. (2006). Labor supply, school attendance, and remittances from international migration: The case of El Salvador. <https://doi.org/10.1596/1813-9450-3903>
- Acosta, P. A., Lartey, E. K., & Mandelman, F. S. (2009). Remittances and the Dutch disease. *Journal of international economics*, 79(1), 102-116.
- Adaawen, S.A., & Owusu, B. (2013). North-South migration and remittances in Ghana. Central Printing Unit.
- Adams Jr, R. H., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World development*, 33(10), 1645-1669.
- Adams, Jr., R. H. (1998). Remittances, investment, and rural asset accumulation in Pakistan. *Economic Development and Cultural Change*, 47(1), 155–173. <https://doi.org/10.1086/452390>
- Adams, Jr., R. H. (2011). Evaluating the economic impact of international remittances on developing countries using household surveys: A literature review. *Journal of Development Studies*, 47(6), 809–828. <https://doi.org/10.1080/00220388.2011.563299>
- Adams, R. H. Jr. (2006). Remittances and poverty in Ghana. <https://doi.org/10.1596/1813-9450-3838>
- Adams, R. H. Jr., Cuecuecha, A., & Page, J. (2008). Remittances, consumption and investment in Ghana. <https://doi.org/10.1596/1813-9450-4515>
- Adams, R. H., & Cuecuecha, A. (2010). Remittances, household expenditure and investment in Guatemala. *World Development*, 38(11), 1626–1641. <https://doi.org/10.1016/j.worlddev.2010.03.003>
- Aggarwal, R., Demirgüç-Kunt, A., & Pería, M. S. M. (2011). Do remittances promote financial development? *Journal of Development Economics*, 96(2), 255–264. <https://doi.org/10.1016/j.jdeveco.2010.10.005>
- Aguilar-Støen, M., Taylor, M., & Castellanos, E. (2016). Agriculture, land tenure and international migration in rural Guatemala: Agriculture, Land and Migration in Rural

- Guatemala. *Journal of Agrarian Change*, 16(1), 123–144.  
<https://doi.org/10.1111/joac.12091>
- Akyeampong, D. K. (2010). Educational expansion and access in Ghana: A review of 50 years of challenge and progress. 16.
- Amuedo-Dorantes, C., & Pozo, S. (2006). Remittances as insurance: Evidence from Mexican immigrants. *Journal of Population Economics*, 19(2), 227–254.  
<https://doi.org/10.1007/s00148-006-0079-6>
- Anarfi, J., Kwankye, S., Ababio, O. M., & Tiemoko, R. (2003). Migration from and to Ghana: A background paper. University of Sussex: DRC on Migration, Globalization and Poverty.
- Angrist, J. (1998). Estimating the labor market impact of voluntary military service using social security data on military applicants.
- Angrist, J.D., & Pischke, J.D. (2010). The credibility revolution in empirical economics. *Journal of Economic Perspectives*. 3-30, 0895-3309. <http://doi.org/10.1257/jep.24.2.3>.
- Awumbila, M., & Ardayfio-Schandorf, E. (2008). Gendered poverty, migration and livelihood strategies of female porters in Accra, Ghana. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 62(3), 171–179. <https://doi.org/10.1080/00291950802335772>
- Azam, J.P., & Gubert, F. (2005). Those in Kayes: The impact of remittances on their recipients in African. *Revue économique*. <https://doi.org/10.3917/reco.566.133/0035-2764>, 1950-6694.
- Baldé, Y. (2011). Impact of remittances and foreign aid on savings. *African Development Review*, 23(2), 247–262. <https://doi.org/10.1111/j.1467-8268.2011.00284.x>
- Banerjee, B. (1984). The probability, size and uses of remittances from urban to rural areas in India. *Journal of Development Economics*, 16(3), 293-311.
- Barham, B., & Boucher, S. (1998). Migration, remittances, and inequality: Estimating the net effects of migration on income distribution. *Journal of Development Economics*, 55(2), 307–331. [https://doi.org/10.1016/S0304-3878\(98\)90038-4](https://doi.org/10.1016/S0304-3878(98)90038-4)

- Bertoli, S., & Marchetta, F. (2014). Migration, remittances and poverty in Ecuador. *The Journal of Development Studies*, 50(8), 1067–1089. <https://doi.org/10.1080/00220388.2014.919382>
- Boakye-Yiadom, L. (2008). Rural-urban linkages and welfare: The case of Ghana's migration and remittance Flows. 290.
- Boakye-Yiadom, L., & Lambon-Quayefio, M. (2017). Remittance receipts by Ghana's households: Understanding their distribution and the impact on investment in basic education. 23.
- Böhme, M. H. (2015). Does migration raise agricultural investment? An empirical analysis for rural Mexico. *Journal of Agricultural Economics*, 34. 1574-0862. <http://doi.org/10.1111/agec.12152>.
- Bolganschi, D. (2011). Rural out migration and land use in Moldova. Center for Policy Studies. 43.
- Brown, R.P.C. (1997). Estimating remittance functions for Pacific Island. *Journal for World Development*. 25(4), 613-626. 0305750X. [http://doi.org/10.1016/S0305-750X\(96\)00122-2](http://doi.org/10.1016/S0305-750X(96)00122-2).
- Buch, C. M., Kuckulenz, A., & Manchec, M-H. L. (2002). Worker remittances and capital flows. 42.
- Caldwell, J. C. (1969). African rural-urban migration. The movement to Ghana's towns. population (French Edition), 27(1), 148. <https://doi.org/10.2307/1529654>
- Cameron, A.C., & Trivedi, P.K. (2005). *Microeconometric: Methods and applications*. Cambridge University Press. 978-0-521-84805-3.
- Cattaneo, M. D. (2010). Efficient semiparametric estimation of multi-valued treatment effects under ignorability. *Journal of Econometrics*, 155(2), 138-154.
- Central Intelligence Authority World Factbook 2017 (CIA, 2017) Retrieved on 15-04-2019 Retrieved at 17:00hrs GMT.

- Chami, R., Fullenkamp, C., & Gapen, M. (2008). Measuring workers' remittances what should be left out. *What Should be Left Out*, 13.
- Chen, D., Hua, D., Reifman, J., & Cheng, X. (2003). Gene selection for multi-class prediction of microarray data. In *CSB* (Vol. 3, p. 492).
- Chiodi, V., Jaimovich, E., & Montes-Rojas, G. (2012). Migration, remittances and capital accumulation: Evidence from rural Mexico. *Journal of Development Studies*, 48(8), 1139–1155. <https://doi.org/10.1080/00220388.2012.688817>
- Cox, D. (1987). Motives for private income transfers. *Journal of Political Economy*, 95(3), 39. [0022-3808/87/9503-004\\$01.50](https://doi.org/10.1086/26150).
- Cox, D., & Jimenez, E. (1990). Achieving social objectives through private transfers: A review. *The World Bank Research Observer*, 5(2), 205–218. <https://doi.org/10.1093/wbro/5.2.205>
- Cox, D., & Rank, M. R. (1992). Inter-vivos transfers and intergenerational exchange. *The Review of Economics and Statistics*, 74(2), 305. <https://doi.org/10.2307/2109662>
- Da Cruz, V., Fengler, W., & Schwartzman, A. (2004). Remittances to comoros: volume, trends, impact and implications. World Bank.
- Damon, A. L. (2010). Agricultural land use and asset accumulation in migrant households: The case of El Salvador. *Journal of Development Studies*, 46(1), 162–189. <https://doi.org/10.1080/00220380903197994>
- Davis, J., & Lopez-Carr, D. (2014). Migration, remittances and smallholder decision-making: Implications for land use and livelihood change in Central America. *Land Use Policy*, 36, 319–329. <https://doi.org/10.1016/j.landusepol.2013.09.001>
- De Brauw, A., & Rozelle, S. (2008). Migration and household investment in rural China. *China Economic Review*, 19(2), 320–335. <https://doi.org/10.1016/j.chieco.2006.10.004>
- de la Brière, B., Sadoulet, E., de Janvry, A., & Lambert, S. (2002). The roles of destination, gender, and household composition in explaining remittances: An analysis for the Dominican Sierra. *Journal of Development Economics*, 68(2), 309–328. [https://doi.org/10.1016/S0304-3878\(02\)00015-9](https://doi.org/10.1016/S0304-3878(02)00015-9)

- Dercon, S. (1998). Wealth, risk and activity choice: cattle in Western Tanzania. *Journal of Development Economics*, 55(1), 1-42.
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (2015). *Agricultural development policy: a contemporary agenda*. GIZ.
- Diao, X., Hazell, P., & Thurlow, J. (2010). The Role of agriculture in African development. *World Development*, 38(10), 1375–1383. <https://doi.org/10.1016/j.worlddev.2009.06.011>
- Duryea, S., Lam, D., & Levison, D. (2007). Effects of economic shocks on children's employment and schooling in Brazil. *Journal of Development Economics*, 84(1), 188–214. <https://doi.org/10.1016/j.jdeveco.2006.11.004>
- Dustmann, C., & Kirchkamp, O. (2002). The optimal migration duration and activity choice after re-migration. *Journal of Development Economics*, 67(2), 351-372. 03043878. [http://doi.org/10.1016/S0304-3878\(01\)00193-6](http://doi.org/10.1016/S0304-3878(01)00193-6).
- Essilfie, F. L. (2018). Varietal seed technology and household income of maize farmers: An application of the doubly robust model. *Technology in Society*, 55, 85–91. <https://doi.org/10.1016/j.techsoc.2018.07.002>
- Food and Agriculture Organization (FAO, 2014) Retrieved on 21-12-2018, Retrieved at 13:00hrs GMT.
- Freund, C., & Spatafora, N. (2008). Remittances, transaction costs, and informality. *Journal of Development Economics*, 86(2), 356–366. <https://doi.org/10.1016/j.jdeveco.2007.09.002>
- Ganyo, E. A. (2013). *Migration, remittances and human capital development in Ghana*. Hague: Institute of Social Studies.
- Ghana Statistical Service. (2012). *Ghana living Standards survey 6 (GLSS 6) report*. Ghana Statistical Service.
- Ghana Statistical Service. (2017). *Ghana living Standards survey 7 (GLSS 7) report*. Ghana Statistical Service.

- Gibson, J., McKenzie, D., & Rohorua, H. (2006). How cost elastic are remittances? Estimates from Tongan migrants in New Zealand. 29.
- Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth. *Journal of Development Economics*, 90(1), 144–152. <https://doi.org/10.1016/j.jdeveco.2008.10.005>
- Gonzalez-Velosa, C. (2011). The Effects of emigration and remittances on agriculture: Evidence from the Philippines.
- Gray, C. L. (2009). Rural out-migration and smallholder agriculture in the southern Ecuadorian Andes. *Population and Environment*, 30(4–5), 193–217. <https://doi.org/10.1007/s11111-009-0081-5>
- Gray, C. L., & Bilsborrow, R. E. (2014). Consequences of out-migration for land use in rural Ecuador. *Land Use Policy*, 36, 182–191. <https://doi.org/10.1016/j.landusepol.2013.07.006>
- Gubert, F. (2002). Do migrants insure those who stay behind? Evidence from the Kayes area (Western Mali). *Oxford Development Studies*, 30(3), 267–287. <https://doi.org/10.1080/1360081022000012699>
- Guo, S., & Fraser, M. W. (2015). *Propensity score analysis*. Sage.
- Gutman, R., & Rubin, D. (2015). Estimation of causal effects of binary treatments in unconfounded studies with one continuous covariate. *Statistical Methods in Medical Research*, 26(3), 1199–1215. <https://doi.org/10.1177/0962280215570722>
- Gyimah-Brempong, K., & Asiedu, E. (2015). Remittances and investment in education: Evidence from Ghana. *The Journal of International Trade & Economic Development*, 24(2), 173–200. <https://doi.org/10.1080/09638199.2014.881907>
- Hagen-Zanker, J., & Siegel, M. (2007). The determinants of remittances: A review of the literature. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.1095719>
- Heckman, J. (1997). Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. *The Journal of Human Resources*, 32(3), 441. 0022166X. <http://doi.org/10.2307/146178>.

- Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1), 153. <https://doi.org/10.2307/1912352>
- Hildebrandt, N., & McKenzie, D. J. (2005). The effects of migration on child health in Mexico. 35.
- Hirano, K., & Imbens, G. W. (2001). Estimation of causal effects using propensity score weighting: An application to data on right heart catheterization. 20.
- Imbens, G. W., & Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of economic literature*, 47(1), 5-86.
- Jokischl, B.D. (2002). Migration and agricultural change: The case of smallholder agriculture in highland Ecuador. *Journal of Human Ecology*.
- Kapur, D., & McHale, J. (2003). Migration's new payoff. *Foreign Policy*, 49-57.
- Khandker, S. R., Koolwal, G. B., & Samad, H. A. (2010). *Handbook on impact evaluation: Quantitative methods and practices*. Washington, D.C: World Bank.
- Kreif, N., Grieve, R., Radice, R., & Sekhon, J. S. (2013). Regression-adjusted matching and double-robust methods for estimating average treatment effects in health economic evaluation. *Health Services and Outcomes Research Methodology*, 13(2-4), 174-202. <https://doi.org/10.1007/s10742-013-0109-2>
- Kwankye, S. O. (2012). Independent North-South child migration as a parental investment in Northern Ghana: Child migration as a parental investment in Northern Ghana. *Population, Space and Place*, 18(5), 535-550. <https://doi.org/10.1002/psp.682>
- Leinbach, T. R., & Watkins, J. F. (1998). Remittances and circulation behavior in the livelihood process: Transmigrant families in South Sumatra, Indonesia. *Economic Geography*, 74(1), 45-63.
- Lerman, Z., & Sutton, W.R. (2008). Productivity and efficiency of small and large farms in transition: Evidence from Moldova. *Post-Soviet Affairs*, 24(2), 97-120. 1060-586X, 1938-2855. <http://doi.org/10.2747/1060-586X.24.2.97>.

- Linden, A., & Samuels, S. J. (2013). Using balance statistics to determine the optimal number of controls in matching studies. *Journal of evaluation in clinical practice*, 19(5), 968-975.
- Linden, A., Uysal, S.D., Ryan, A., & Adams, J.L. (2016). Estimating causal effects for multivalued treatments: A Comparison of Approaches. *Statistics in Medicine*, 35(4), 534-552. 02776715. <http://doi.org/10.1002/sim.6768>.
- Litchfield, J., & Waddington, H. (2003). Migration and poverty in Ghana: evidence from the Ghana Living Standardss Survey. In *International Workshop on Migration and Poverty in West Africa*, University of Sussex, Brighton (pp. 13-14).
- Liu, Q., & Reilly, B. (2004). Income transfers of Chinese rural migrants: some empirical evidence from Jinan. *Applied Economics*, 36(12), 1295-1313
- Lopez, J. H., Fajnzylber, P., & Acosta, P. (2007). The impact of remittances on poverty and human capital: evidence from Latin American household surveys. The World Bank.
- Lu, W., & Tsiatis, A.A. (2006). Semiparametric Transformation Models for the Case-Cohort Study. *Biometrika*, 93(1), 207-214. 1464-3510, 0006-3444. <http://doi.org/10.1093/biomet/93.1.207>.
- Lucas, R. E. B. (1987). Emigration to South Africa's mines. *American Economic Association*, 77(3), 313-330.
- Lucas, R. E. B., & Stark, O. (1985). Motivations to remit: Evidence from Botswana. *Journal of Political Economy*, 93(5), 901-918.
- Maimbo, S. M., & Ratha, D. (Eds.). (2005). *Remittances: Development impact and future prospects*. Washington, DC: World Bank.
- Massey, D. S., & Parrado, E. A. (1998). International migration and business formation in Mexico. *University of Texas Press*, 79(1), 1-20.
- Mazzucato, V., Van Den Boom, B., & Nsowah-Nuamah, N. N. (2008). Remittances in Ghana: Origin, destination and issues of measurement. *International Migration*, 46(1), 103-122.

- Mazzucato, V., van den Boom, B., & Nsowah-Nuamah, N. N. N. (2004). The impact of international remittances on local living Standards: Evidence for households in Ghana. In United Nations Development Programme Conference on Migration and Development.
- McCarthy, N., Davis, B., Carletto, G., & Maltsoğlu, I. (2006). Assessing the impact of massive out-migration on agriculture. 32.
- Mckenzie, D., & Rapoport, H. (2007). Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico. *Journal of Development Economics*, 84(1), 1–24. <https://doi.org/10.1016/j.jdeveco.2006.11.003>
- Mendola, M. (2008). Migration and technological change in rural households: Complements or substitutes? *Journal of Development Economics*, 85(1–2), 150–175. <https://doi.org/10.1016/j.jdeveco.2006.07.003>
- Mensah-Bonsu, A. (2003). Migration and environmental pressure in northern Ghana.
- Miluka, J., Carletto, G., Davis, B., & Zezza, A. (2007). The vanishing farms? The impact of international migration on Albanian family farming. *Journal of Development Studies*, 46(1), 140–161. <https://doi.org/10.1080/00220380903197978>
- Ministry of Food and Agriculture (MoFA, 2016), Agricultural facts and figures
- Orozco, M. (2003). Workers' remittances in an international scope. 14.
- Owiafe, G. (2008). A thesis submitted to the Department of Economics, in partial fulfilment of the requirements for the award of Master of Arts Degree in Economics. 102.
- Özden, Ç., & Schiff, M. W. (Eds.). (2006). International migration, remittances, and the brain drain. Washington, DC: World Bank: Palgrave Macmillan.
- Page, J., & Plaza, S. (2006). Migration remittances and development: A review of global evidence. *Journal of African Economies*, 15(2), 245-336. <http://doi.org/10.1093/jae/ejl035>.

- Pfeiffer, L., Richter, S., Fletcher, P., & Taylor, J. E. (2007). Gender in economic research on international migration and its impacts: a critical review. *The international migration of women*, 11-51
- Piras, S., Vittuari, M., Möllers, J., & Herzfeld, T. (2018). Remittance inflow and smallholder farming practices. The case of Moldova. *Land Use Policy*, 70, 654–665. <https://doi.org/10.1016/j.landusepol.2017.10.050>
- Quartey, P., & Blankson, T. (2004). Do migrant remittances minimize the impact of macro-volatility on the poor in Ghana? Global Development Network.
- Quartey, P., (2006) Migrant remittances and household welfare in times of macro-volatility: The case of Ghana. No. 69. Institute of Statistical, Social & Economic Research, University of Ghana, Legon.
- Quartey, P., Ackah, C., & Lambon-Quayefio, M.P. (2018). Inter-linkages between remittance and savings in Ghana. *International Journal of Social Economics*. 0306-8293. <http://doi.org/10.1108/IJSE-12-2017-0618>
- Rahman, M. (2009). Contributions of exports, FDI and expatriates' remittances to real GDP of Bangladesh, India, Pakistan And Sri Lanka. 14.
- Randazzo, T., & Piracha, M. (2014). Remittances and household expenditure behavior in Senegal. *Institute of Labor Economics*. 40.
- Rapoport, H., & Docquier, F. (2005). The economics of migrants' remittances. *Institute of Labor Economics*. 83.
- Ratha, D. (2013). The impact of remittances on economic growth and poverty reduction. *Policy Brief*, 8(1), 1-13.
- Ratha, D., & Shaw, W. (2007). South-South migration and remittances. The World Bank Group. 978-0-8213-7072-8 978-0-8213-7073-5. <http://doi.org/10.1596/978-0-8213-7072-8>.
- Robins, J. M., & Rotnitzky, A. (1995). Semiparametric efficiency in multivariate regression models with missing data. *Journal of the American Statistical Association*, 90(429), 122–129. <https://doi.org/10.1080/01621459.1995.10476494>

- Robins, J. M., Rotnitzky, A., & Zhao, L. P. (1995). Analysis of semiparametric regression models for repeated outcomes in the presence of missing data. *Journal of the American statistical association*, 90(429), 106-121.
- Rodriguez, E. R. (1998). International migration and income distribution in the Philippines. *Economic Development and Cultural Change*, 46(2), 329–350. <https://doi.org/10.1086/452341>
- Rosenbaum, P.R., & Rubin, D.B. (1983). The central role of the propensity score in observational study for causal effects. *Biometrika*, 70(1), 41-55.
- Rozelle, S., Taylor, J. E., & deBrauw, A. (1999). Migration, remittances, and agricultural productivity in China. *American Economic Review*, 89(2), 287–291. <https://doi.org/10.1257/aer.89.2.287>
- Rubin, D. B. (2006). *Matched sampling for causal effects*. Cambridge University Press.
- Rubin, D.B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, 66(5), 688-701. 0022-0663. <http://doi.org/10.1037/h0037350>.
- Salomone, S. (2006). *Remittances. Overview of the existing literature*. 23.
- Sander, C. (2003). *Migrant remittances to developing countries: A scoping study - Overview and introduction to issues for pro-poor financial services*. 45.
- Stark, O., & Lucas, R. E. B. (1988). Migration, remittances, and the family. *economic development and cultural change*, 36(3), 465–481.
- StataCorp. (2017). *Stata 15 Treatment Effect Manual: Potential Outcomes/Counterfactual Outcomes*. Stata Press: College Station, TX: StataCorp LLC.
- Suro, R. (2003). *Remittance senders and receivers: Tracking the transnational channels*. Pew Hispanic Center.
- Van der Laan, M. J., Laan, M. J., & Robins, J. M. (2003). *Unified methods for censored longitudinal data and causality*. Springer Science & Business Media.

- Van der Laan, M. J., Laan, M. J., & Robins, J. M. (2003). *Unified methods for censored longitudinal data and causality*. Springer Science & Business Media.
- Vasco, C. (2011). *The Impact of international migration and remittances on agricultural production patterns, labor relationships and entrepreneurship: The case of rural Ecuador*. Kassel: Kassel Univ. Press.
- Woodruff, C., & Zenteno, R. (2007). Migration networks and microenterprises in Mexico. *Journal of development economics*, 82(2), 509-528.
- Wooldridge, J. M. (2007). Inverse probability weighted estimation for general missing data problems. *Journal of econometrics*, 141(2), 1281-1301.
- Wooldridge, J. M. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, 104(3), 112-114.
- Wooldridge, J. M. (2010). *Correlated random effects models with unbalanced panels*. Michigan State University, Department of Economics.
- World Bank (2016), *Migration and Remittances Factbook*. World Bank, Washington, DC.
- World Bank (2018), *Migration and Development Brief, 29*, World Bank, Washington, DC.
- Wouterse, F., & Taylor, J. E. (2008). Migration and income diversification: *World Development*, 36(4), 625–640. <https://doi.org/10.1016/j.worlddev.2007.03.009>
- Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. 41.
- Yang, D., & Choi, H. (2007). Are remittances insurance? Evidence from rainfall shocks in the Philippines. *The World Bank Economic Review*, 21(2), 219–248. <https://doi.org/10.1093/wber/lhm003>

## APPENDIX

**Table A1: Determinants of remittance receipts in Ghana**

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
	Overall remittance	Marginal effect	Domestic remittance	Marginal effect	International remittance	Marginal effect
Sex of household head (Base- Female)						
Head-Male	-0.486***	-0.169***	-0.463***	-0.152***	-0.204***	-0.019***
	(0.031)	(0.011)	(0.031)	(0.011)	(0.051)	(0.005)
Head-age	-0.034***	-0.011***	-0.033***	-0.010***	0.001	0.000
	(0.005)	(0.002)	(0.005)	(0.002)	(0.009)	(0.001)
Head-age square	0.000***	0.000***	0.000***	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household size	0.013*	0.004*	0.005	0.001	0.028**	0.003**
	(0.007)	(0.002)	(0.007)	(0.002)	(0.012)	(0.001)
Household educational level (Base-Tertiary)						
Head-No education	-0.121*	-0.040*	0.039	0.012	-0.505***	-0.048***
	(0.065)	(0.022)	(0.071)	(0.022)	(0.093)	(0.011)
Head-Basic	-0.020	-0.007	0.084	0.026	-0.195*	-0.023*
	(0.071)	(0.024)	(0.077)	(0.024)	(0.103)	(0.013)
Head-Secondary	-0.037	-0.013	0.033	0.010	-0.166*	-0.020*
	(0.066)	(0.022)	(0.072)	(0.022)	(0.089)	(0.011)
Head-Vocational/Technical/Teacher training	-0.032	-0.011	0.019	0.006	-0.086	-0.011
	(0.087)	(0.029)	(0.097)	(0.029)	(0.107)	(0.014)
Employment status (Base-Employed)						
Unemployed	0.375***	0.132***	0.266***	0.087***	0.329***	0.036***
	(0.047)	(0.017)	(0.048)	(0.017)	(0.071)	(0.009)
Poverty status (Base-Non-poor)						
Very poor	-0.365***	-0.113***	-0.304***	-0.088***	-0.450***	-0.030***
	(0.053)	(0.015)	(0.053)	(0.014)	(0.163)	(0.008)
Poor	-0.158***	-0.052***	-0.098**	-0.030**	-0.309***	-0.023***
	(0.040)	(0.013)	(0.041)	(0.012)	(0.090)	(0.006)
Location (Base-Urban)						
Rural	0.139***	0.046***	0.216***	0.068***	-0.280***	-0.024***
	(0.030)	(0.010)	(0.031)	(0.010)	(0.053)	(0.004)
Household income	-0.000**	-0.000**	-0.000***	-0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Region (Base-Greater Accra)						
Western Region	0.284**	0.082***	0.144	0.039	0.424	0.026
	(0.115)	(0.032)	(0.116)	(0.031)	(0.294)	(0.017)
Central Region	0.011	0.003	-0.069	-0.017	0.119	0.006
	(0.117)	(0.031)	(0.117)	(0.030)	(0.296)	(0.014)
Volta Region	0.649***	0.207***	0.550***	0.171***	0.363	0.021
	(0.115)	(0.033)	(0.115)	(0.033)	(0.297)	(0.017)

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
	Overall remittance	Marginal effect	Domestic remittance	Marginal effect	International remittance	Marginal effect
Eastern Region	0.573*** (0.120)	0.180*** (0.035)	0.427*** (0.121)	0.128*** (0.034)	0.579* (0.303)	0.041** (0.020)
Ashanti Region	0.632*** (0.121)	0.201*** (0.035)	0.388*** (0.122)	0.115*** (0.034)	0.888*** (0.300)	0.082*** (0.024)
Brong Ahafo Region	0.653*** (0.123)	0.209*** (0.036)	0.378*** (0.124)	0.112*** (0.035)	1.013*** (0.307)	0.103*** (0.027)
Northern Region	0.829*** (0.131)	0.274*** (0.040)	0.693*** (0.132)	0.223*** (0.040)	0.258 (0.344)	0.014 (0.019)
Upper East Region	0.473*** (0.134)	0.145*** (0.040)	0.359*** (0.134)	0.106*** (0.039)	0.248 (0.333)	0.013 (0.018)
Upper West Region	0.609*** (0.133)	0.193*** (0.040)	0.465*** (0.133)	0.141*** (0.039)	0.360 (0.347)	0.021 (0.021)
Ecological zone (Base-GAMA)						
Coastal Ecological zone	0.053 (0.117)	0.018 (0.039)	0.122 (0.119)	0.036 (0.035)	-0.077 (0.292)	-0.011 (0.044)
Forest Ecological zone	0.011 (0.127)	0.004 (0.042)	0.210 (0.129)	0.065* (0.038)	-0.530* (0.303)	-0.059 (0.043)
Savannah Ecological zone	-0.145 (0.138)	-0.047 (0.045)	0.066 (0.140)	0.020 (0.041)	-0.627* (0.325)	-0.066 (0.044)
Constant	-0.014 (0.147)		-0.297* (0.153)		-1.631*** (0.230)	
Psuedo	0.0888		0.0866		0.0955	
Prob>Chi2	0.000		0.000		0.000	
Observations	16,765		16,772		16,772	
Robust Standards errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Source: Author's construct from GLSS 6 data

**Table A2: Recipient (Famland\_1) and non-recipient (Farmland\_0) farmland regressions together with first stage probit regression.**

Explanatory variables	(1) Probit Remittance		(2) Adjusted-OLS Farmland_1		(3) Adjusted-OLS Farmland_0	
Sex of household head (Base-Female)						
Head-Male	-0.494***	(0.031)	0.433***	(0.138)	0.347***	(0.124)
Head-age	-0.035***	(0.005)	0.016	(0.018)	-0.005	(0.015)
Head-age square	0.000***	(0.000)	0.000	(0.000)	0.000	(0.000)
Household size	0.014**	(0.007)	0.105***	(0.017)	0.073***	(0.012)
Household educational level (Base-Tertiary)						
Head-No education	-0.103	(0.066)	0.321	(0.315)	0.189	(0.232)
Head-Basic	-0.003	(0.072)	0.424	(0.336)	0.415*	(0.247)
Head-Secondary	-0.024	(0.066)	0.368	(0.317)	0.325	(0.234)
Head-Vocational/Technical/Teacher training	-0.023	(0.087)	0.742**	(0.372)	0.144	(0.303)
Employment status (Base-Employed)						
Unemployed	0.380***	(0.047)	-0.191	(0.185)	-0.569***	(0.178)
Poverty status(Base-Non-poor)						
Very poor	-0.358***	(0.053)	-1.207***	(0.180)	-0.745***	(0.111)
Poor	-0.151***	(0.041)	-0.668***	(0.125)	-0.400***	(0.090)
Location (Base-Urban)						
Rural	0.140***	(0.030)	-0.006	(0.107)	0.309***	(0.086)
Household income	-0.000**	(0.000)	0.000*	(0.000)	0.000**	(0.000)
Region (Base-Greater Accra)						
Western Region	0.279**	(0.115)				
Central Region	0.017	(0.116)				
Volta Region	0.647***	(0.115)				
Eastern Region	0.575***	(0.120)				
Ashanti Region	0.631***	(0.121)				
Brong Ahafo Region	0.645***	(0.123)				
Northern Region	0.826***	(0.131)				
Upper East Region	0.473***	(0.134)				
Upper West Region	0.606***	(0.133)				
Ecological zone (Base-GAMA)						
Coastal Ecological zone	0.047	(0.117)	-2.337***	(0.849)	-0.402	(1.113)
Forest Ecological zone	0.003	(0.127)	-0.969	(0.840)	0.525	(1.109)

	(1)		(2)		(3)	
Explanatory variables	Probit		Adjusted-OLS		Adjusted-OLS	
	Remittance		Farmland_1		Farmland_0	
Savannah Ecological zone	-0.147	(0.138)	-1.477*	(0.845)	-0.033	(1.110)
Remittance expenditure	0.000***	(0.000)				
Selectivity			0.498*	(0.282)	-0.881***	(0.300)
Constant	-0.013	(0.147)	7.094***	(0.983)	7.195***	(1.201)
Observations	16,765		1,530		2,405	
Pseudo R <sup>2</sup>	0.0896					
R-squared (R <sup>2</sup> )			0.1686		0.1182	
Adjusted R <sup>2</sup>			0.1593		0.1119	
F			18.04		18.83	
Root MSE			1.6295		1.5477	
Prob>F			0.000		0.000	
*** p<0.01, ** p<0.05, * p<0.1; Robust Standards errors in parentheses						
Root MSE: Root Mean of Square Error						

**Source: Author's construct from GLSS 6 data**

**Table A3: Recipient (Livestock\_1) and non-recipient (Livestock\_0) livestock holding regressions together with first stage probit regression.**

Explanatory variables	(1) Probit Remittance	(2) Adjusted- OLS Livestock_1	(3) Adjusted- OLS Livestock_0
Sex of household head (Base- Female)			
Head-Male	-0.494*** (0.031)	0.910*** (0.092)	0.583*** (0.091)
Head-age	-0.035*** (0.005)	0.040*** (0.012)	-0.008 (0.011)
Head-age square	0.000*** (0.000)	-0.000*** (0.000)	0.000* (0.000)
Household size	0.014** (0.007)	0.101*** (0.010)	0.127*** (0.008)
Household educational level (Base-Tertiary)			
Head-No education	-0.103 (0.066)	-0.207 (0.216)	-0.146 (0.160)
Head-Basic	-0.003 (0.072)	-0.289 (0.232)	-0.338* (0.174)
Head-Secondary	-0.024 (0.066)	-0.363* (0.218)	-0.228 (0.164)
Head-Vocational/Technical/Teacher training	-0.023 (0.087)	-0.307 (0.267)	-0.374* (0.220)
Employment status (Base-Employed)			
Unemployed	0.380*** (0.047)	-0.258** (0.111)	0.016 (0.108)
Poverty status (Base-Non-poor)			
Very poor	-0.358*** (0.053)		-0.475*** (0.079)
Poor	-0.151*** (0.041)		-0.314*** (0.061)
Location (Base-Urban)			
Rural	0.140*** (0.030)	0.173** (0.073)	0.210*** (0.065)
Household income	-0.000** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Region (Base-Greater Accra)			
Western Region	0.279** (0.115)		
Central Region	0.017 (0.116)		
Volta Region	0.647*** (0.115)		
Eastern Region	0.575*** (0.120)		
Ashanti Region	0.631*** (0.121)		
Brong Ahafo Region	0.645*** (0.123)		
Northern Region	0.826*** (0.131)		
Upper East Region	0.473*** (0.134)		
Upper West Region	0.606*** (0.133)		
Ecological zone (Base-GAMA)			
Coastal Ecological zone	0.047 (0.117)	-2.296*** (0.573)	-0.405 (0.319)
Forest Ecological zone	0.003 (0.127)	-1.946*** (0.568)	-0.043 (0.312)
Savannah Ecological zone	-0.147 (0.138)	-1.231** (0.567)	0.635** (0.311)
Remittance expenditure	0.000*** (0.000)		
Selectivity		-0.537*** (0.190)	-0.659*** (0.242)
Constant	-0.013 (0.147)	6.133*** (0.651)	5.287*** (0.464)
Observations	16,765	2,625	4,552
Pseudo R <sup>2</sup>	0.0896		
R-squared (R <sup>2</sup> )		0.2100	0.1729

	(1) Probit	(2) Adjusted- OLS	(3) Adjusted- OLS
Explanatory variables	Remittance	Livestock_1	Livestock_0
Adjusted $R^2$		0.2054	0.1698
F		46.23	55.76
Root MSE		1.4583	1.4924
Prob>F		0.000	0.000

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Robust Standards errors in parentheses  
 Root MSE: Root Mean of Square Error

**Source: Author's construct from GLSS 6 data**

**Table A4: Recipient (Equipment\_1) and non-recipient (Equipment\_0) agricultural equipment regressions together with first stage probit regression.**

Explanatory variables	(1)		(2)		(3)	
	Probit		Adjusted-OLS		Adjusted-OLS	
	Remittance		Equipment_1		Equipment_0	
Sex of household head (Base- Female)						
Head-Male	-0.494***	(0.031)	0.361***	(0.122)	0.097	(0.117)
Head-age	-0.035***	(0.005)	0.004	(0.014)	0.005	(0.014)
Head-age square	0.000***	(0.000)	0.000	(0.000)	0.000	(0.000)
Household size	0.014**	(0.007)	0.087***	(0.012)	0.071***	(0.010)
Household educational level (Base-Tertiary)						
Head-No education	-0.103	(0.066)	-1.081***	(0.253)	-0.330	(0.205)
Head-Basic	-0.003	(0.072)	-0.940***	(0.271)	-0.452**	(0.219)
Head-Secondary	-0.024	(0.066)	-1.057***	(0.253)	-0.347*	(0.207)
Head-Vocational/Technical/Teacher training	-0.023	(0.087)	-1.071***	(0.302)	-0.467*	(0.265)
Employment status (Base-Employed)						
Unemployed	0.380***	(0.047)	-0.132	(0.149)	0.213	(0.147)
Poverty status (Base-Non-poor)						
Very poor	-0.358***	(0.053)	-0.901***	(0.136)	-0.765***	(0.100)
Poor	-0.151***	0.041	-0.570***	(0.096)	-0.335***	(0.075)
Location (Base-Urban)						
Rural	0.140***	(0.030)	0.193**	(0.086)	-0.042	(0.077)
Household income	-0.000**	(0.000)	0.000	(0.000)	0.000***	(0.000)
Region (Base-Greater Accra)						
Western Region	0.279**	(0.115)				
Central Region	0.017	(0.116)				
Volta Region	0.647***	(0.115)				
Eastern Region	0.575***	(0.120)				
Ashanti Region	0.631***	(0.121)				
Brong Ahafo Region	0.645***	(0.123)				
Northern Region	0.826***	(0.131)				
Upper East Region	0.473***	(0.134)				
Upper West Region	0.606***	(0.133)				
Ecological zone (Base-GAMA)						
Coastal Ecological zone	0.047	(0.117)	-0.288	(0.974)	0.956	(0.764)
Forest Ecological zone	0.003	(0.127)	-0.661	(0.966)	0.705	(0.759)
Savannah Ecological zone	-0.147	(0.138)	-0.392	(0.966)	0.788	(0.759)
Remittance expenditure	0.000***	(0.000)				
Selectivity			0.895***	(0.261)	-1.416***	(0.301)
Constant	-0.013	(0.147)	3.412***	(1.010)	3.993***	(0.873)
Observations	16,765		1,590		3,101	
Pseudo R <sup>2</sup>	0.0896					

	(1) Probit	(2) Adjusted- OLS	(3) Adjusted- OLS
Explanatory variables	Remittance	Equipment_ 1	Equipment _0
R-squared ( $R^2$ )		0.1308	0.0562
Adjusted $R^2$		0.1214	0.0510
F		13.92	10.8
Root MSE		1.3069	1.5017
Prob>F		0.000	0.000
*** p<0.01, ** p<0.05, * p<0.1; Robust Standards errors in parentheses			
Root MSE: Root Mean of Square Error			

**Source: Author's construct from GLSS 6 data**

**Table A5: The impact of remittance receipts on the accumulation of farmland**

	Mean Percentage Gain	Mean Percentage with Gain	Mean Percentage with Loss
Farmland	-35	15 %	85 %
Number of Households	3,942	588	3,354

**Source: Author's construct from GLSS 6 data**

s

**Table A6: The impact of remittance receipts on the households' holdings of livestock**

	Mean Percentage Gain	Mean Percentage with Gain	Mean Percentage with Loss
Livestock holding	36	60 %	40 %
Number of Households	7,184	4,301	2,883

**Source: Author's construct from GLSS 6 data**

**Table A7: The impact of remittance receipts on the accumulation of agricultural equipment**

	Mean Percentage Gain	Mean Percentage with Gain	Mean Percentage with Loss
Agricultural equipment	-67	2%	98%
Number of Households	4,698	98	4,600

**Source: Author's construct from GLSS 6 data**

**Table A8: Linktest for livestock ownership**

Ownership of Livestock	Coefficient	Robust Standards error	z	P>z
_hat	1.000525	0.0196878	50.82	0.000
_hatsq	0.0007388	0.0175966	0.04	0.967
Constant	-0.0004241	0.018087	-0.02	0.981

**Source: Author's construct from GLSS 6 data**

**Table A9: Linktest for agricultural equipment ownership**

Ownership of Agricultural equipment	Coefficient	Robust Standards		
		error	z	P>z
_hat	1.000963	0.0335458	29.84	0.000
_hatsq	0.0007448	0.0275936	0.03	0.978
Constant	-0.0000814	0.0184939	-0.00	0.996

Source: Author's construct from GLSS 6 data

**Table A10: Linktest for farmland ownership**

Ownership of farmland	Coefficient	Robust		
		Standards error	z	P>z
_hat	1.001632	0.0168174	59.56	0.00
_hatsq	0.0089147	0.0162419	0.55	0.583
Constant	-0.0083018	0.0221698	-0.37	0.708

Source: Author's construct from GLSS 6 data

**Table A11: Relationship of the remitter to household head**

Relationship of remitter to household head	GLSS-6		GLSS-7	
	Male	Female	Male	Female
Parent	11.38	8.11	5.14	3.82
Spouse	18.64	3.78	7.46	14.69
Child	57.98	68.11	57.66	61.37
Brother/Sister	3.63	2.7	13.51	3.62
Other relatives	4.42	15.68	11.59	11.87
Non-relatives	3.95	1.62	4.64	4.63
Total	100	100	100	100

Source: Author's construct from GLSS 6 and GLSS 7 data

**Table A12: Unadjusted pre-participation characteristics of overall remittance recipients and non-remittance recipients.**

	Treated		Control		Balance
	Mean	Variance	Mean	Variance	Absolute Standardized Difference
Sex	1.395438	0.2391084	1.222827	0.1731909	0.3801691
Age	49.16577	319.9283	44.1076	208.8965	0.3110656
Age square	2737.145	3581338	2154.358	2114887	0.3453276
Household size	4.076963	7.408914	4.362911	7.899679	0.1033554
Educational level	1.952986	1.389639	2.036835	1.485441	0.0699341
Employment	0.8366707	0.1366766	0.9248775	0.0694854	0.2747342
Poverty status	1.699286	0.3757693	1.64335	0.4421566	0.0874687
Household income	6064.69	6.27E+09	9291.225	4.19E+09	0.0446261
Ecological zone	2.320042	0.612289	2.454818	0.7700752	0.1621122
Location	1.570085	0.2451307	1.548993	0.2476222	0.0424939
Region	5.537176	7.078337	5.264743	8.16237	0.0986896

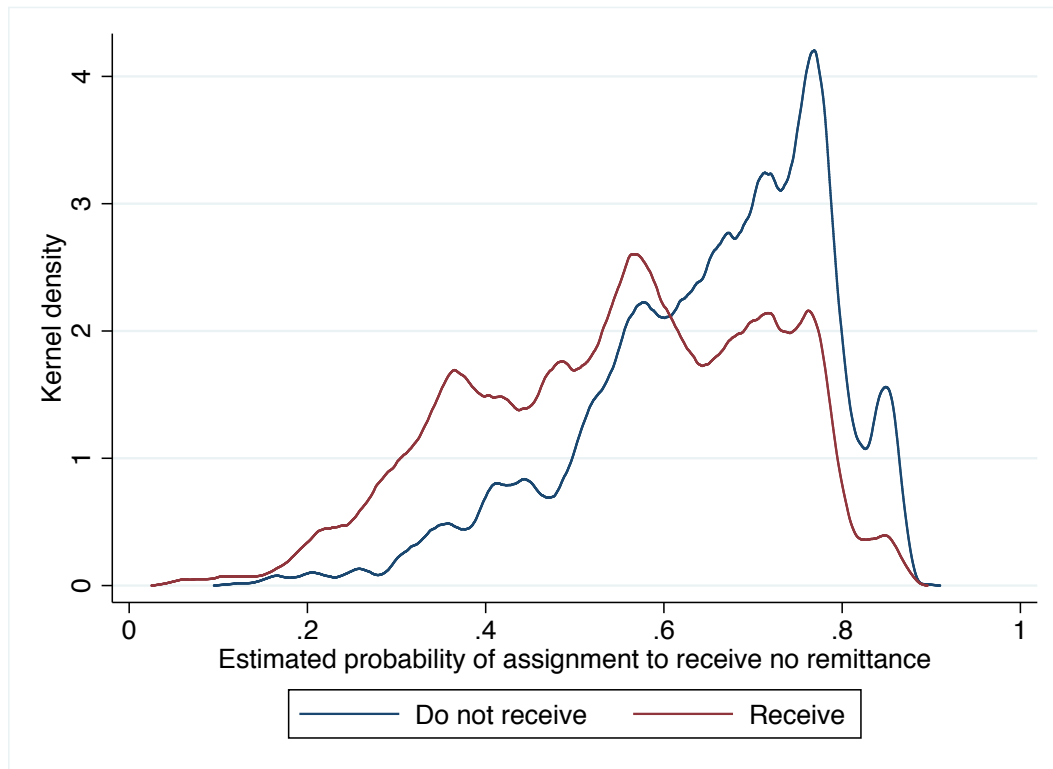
Source: Author's construct from GLSS 6 data

**Table A13: Weighted pre-participation characteristics of overall remittance recipients and non-remittance recipients.**

	Treated		Control		Balance
	Mean	Variance	Mean	Variance	Absolute Standardized Difference
Sex	1.275647	0.1997004	1.278146	0.2007992	0.005586
Age	45.79784	251.6816	46.46779	277.6517	0.0411804
Age square	2349.08	2579014	2436.882	3245367	0.0514509
Household size	4.265242	7.491624	4.317658	8.00236	0.0188322
Educational level	1.996656	1.447072	1.99504	1.456373	0.0013406
Employment	0.8979685	0.091637	0.8850047	0.1017806	0.0416868
Poverty status	1.638201	0.4506624	1.664672	0.414192	0.040254
Household income	12682.73	1.30E+10	6976.962	1.04E+10	0.0527828
Ecological zone	2.420328	0.7321294	2.415966	0.7163349	0.0051248
Location	1.550174	0.2475257	1.566043	0.2456607	0.0319553
Region	5.346358	8.194849	5.38872	7.75265	0.0150017

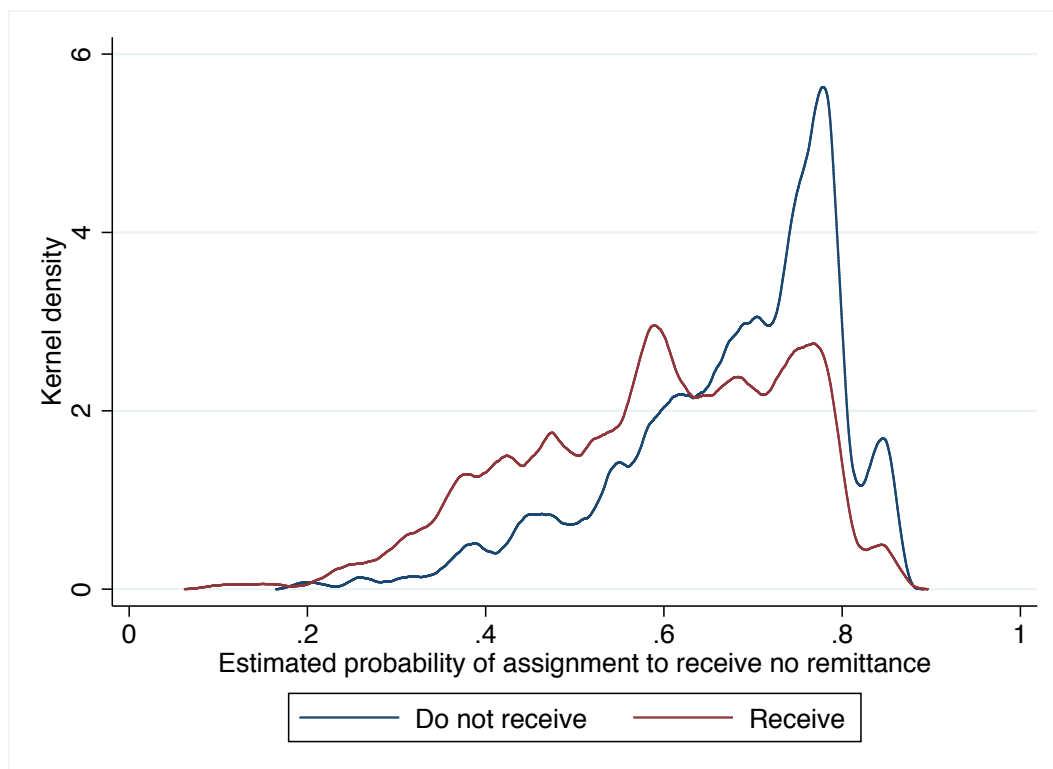
Source: Author's construct from GLSS 6 data

**Figure A1: An overlap plot for the receipts of overall remittance**



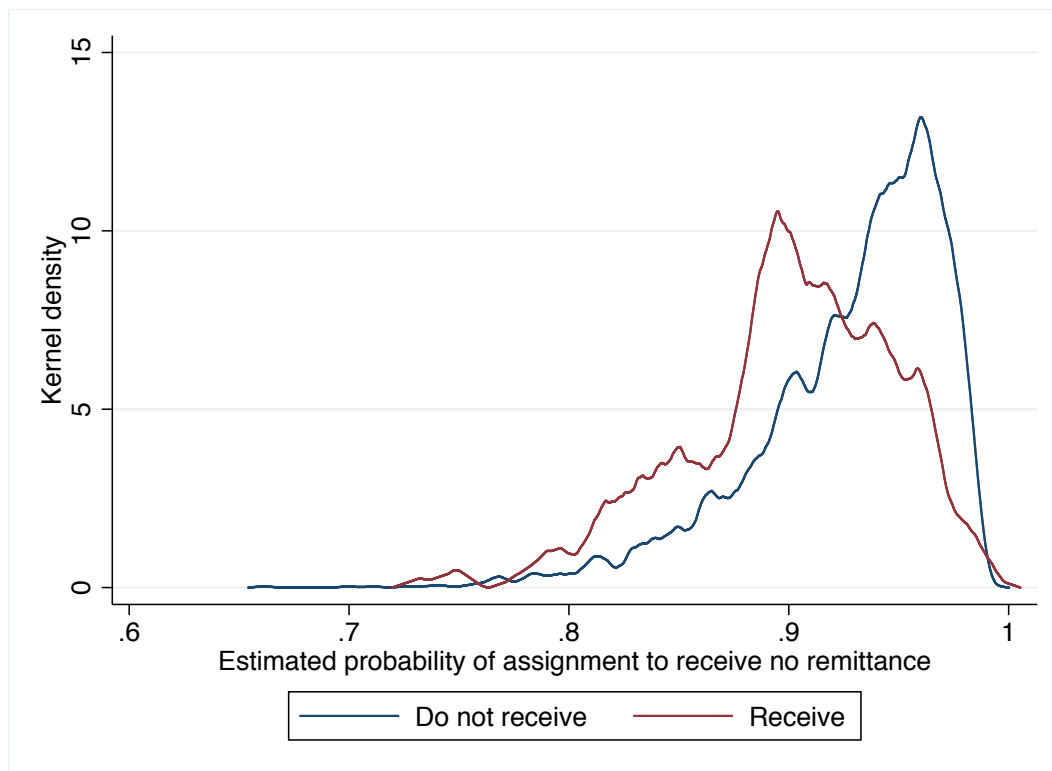
Source: Author's construct from GLSS 6 data

**Figure A2: An overlap plot for the receipts of only domestic remittance**



Source: Author's construct from GLSS 6 data

**Figure A3: An overlap plot for the receipts of only International remittance**



**Source: Author's construct from GLSS 6 data**