



**Essays on remittances, welfare and productivity of agricultural households
in selected sub-Saharan African countries**

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DECLARATION: PLAGIARISM

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ABSTRACT

The study assesses the impact of remittance flows on the productivity and welfare of agricultural households in sub-Saharan Africa. The thesis is organised into three empirical essays.

The first empirical essay tests the impact of remittance receipts on agricultural productivity in Ghana. Using propensity score matching (PSM) methods it assesses whether heterogeneity in the economic activity of farming households affects the effects of remittances on the productivity of tradable and non-tradable crop farming households in Ghana. We find that, the involvement of farming households in other economic activities alters the impact of remittances on crop yield. This differential impact also varies according to whether the crop is tradeable or not.

The second essay answers the question: What is the distributional effect of remittances on household welfare in The Gambia? We examine this question with an instrumental variable quantile regression approach to estimate the distributional welfare effect of remittances in The Gambia. After instrumenting for the endogenous remittance variable in the model and controlling for household demographic characteristics, the paper finds that the effect of remittance on household welfare is positive and significant; however, the effect is not uniform across the income quantiles. We find that rich households receiving remittances have greater welfare impacts than low-income households receiving remittances. Even though remittances have a higher welfare impact on rich households, the impact of a 10.12% increase in the welfare of low-income households is substantial. This suggests the possibility that remittances can be an enabling channel for low-income households to migrate to middle income status.

The third essay estimates the impact of remittances on vulnerability to expected poverty among agricultural households in Ghana, Nigeria and The Gambia. We found that households that benefitted from remittances in all three countries could smoothing consumption to reduce their vulnerability to expected poverty and therefore guard against future poverty. In addition, although urban households were less vulnerable than rural households to expected poverty, rural households that received remittances became less

vulnerable to expected poverty. This underscores the importance of remittances in enhancing the welfare of poorer households.

The overall conclusion of the study is that remittances provide non-labour income that helps to improve the welfare of agricultural households, reduce poverty levels and reduce the vulnerability of agricultural households to expected poverty. These positive effects of remittances are more on poorer households. Since agricultural households are generally among the poor and vulnerable population in SSA, the results show that remittance helps to reduce the poverty and vulnerability to poverty among the poor of the poor. It is recommended that governments in sub-Saharan Africa put in place policies that ensure a reduction in the cost of sending remittances especially to rural farming households as an indirect way of reducing vulnerability to expected poverty.

Keywords

Remittance, agricultural productivity, expected poverty, welfare, propensity score matching, instrumental variable quantile regression.

OPSOMMING

Oorbetalings word toenemend belangrik as 'n bron van kapitaal in ontwikkelende ekonomieë. Wat veral vir akademici en beleidmakers van belang is, is die potensiële impak daarvan op ontvanger-huishoudings. Die studie ondersoek die verhouding tussen die oorblywende vloei na Afrika suid van die Sahara en die ontwikkeling van die landbou te beoordeel deur te fokus op die gevolge vir produktiwiteit en huishoudelike welstand. Die proefskrif is georganiseer in drie empiriese opstelle.

Die eerste empiriese opstel toets die impak van die oorbetalings ontvang op landbouproduktiwiteit. Die opstel gebruik ooreenstemming in geneigdheidstelling-metodes (PSM) om empiries te beoordeel of heterogeniteit in die ekonomiese aktiwiteit van boerderyhuishoudings die gevolge van oorbetalings op produktiwiteit van verhandelbare en nie-verhandelbare gewasboerdery in Ghana beïnvloed. Ons het gevind dat die betrokkenheid van huishoudings in ander ekonomiese aktiwiteite die impak van oorbetalings op die opbrengs van die oes verander. Hierdie differensiële impak wissel ook afhangende of die gewas verhandelbaar is of nie. Hierdie referaat dra by tot kennis deur te ondersoek of die effek van oorbetalings op landbouproduktiwiteit verskil volgens die aard van gewasproduksie; groot uitvoergewasse teenoor voedsel/nie-uitvoergewasse. Die innovasie in hierdie proefskrif is die uiteensetting van die effek van oorbetalings op produktiwiteit gebaseer op die verhandelbaarheid van die gewas.

Die tweede opstel beantwoord die vraag: Wat is die verspreidings effek van oorbetalings op huishoudelike welsyn in Gambië? Ons ondersoek hierdie vraag met 'n instrumentele veranderlike kwantielregressie-benadering om die verspreiding van die welstandseffek van oorbetalings in Gambië te beraam met behulp van Gambië se Derde Geïntegreerde Huishoudelike Opname (GHO). Na die instrumentering van die endogene oorbetalingsveranderlike in die model en die beheer van huishoudelike demografiese eienskappe, het die ondersoek gevind dat die gevolge van oorbetalings op huishoudelike welstand positief en beduidend is, maar, nie eenvormig oor die inkomstekwantiele nie. Ons vind dat ryk huishoudings wat oorbetalings ontvang, groter welstandimpakte het as huishoudings met 'n lae inkomste wat oorbetalings ontvang. Alhoewel oorbetalings 'n hoër welstandsimpak op ryk huishoudings het, is die impak van 9,64 persent toename in die welstand van huishouding met 'n lae inkomste aansienlik. Dit dui op die moontlikheid

dat oorbetalings 'n instaatstellende kanaal kan wees vir huishoudings met 'n lae inkomste om na die middel inkomstestatus te migreer. Hierdie referaat lewer 'n beduidende bydrae tot kennis deur die verspreidingswelsyn-effekte van oorbetalings op huishoudelike welsyn te skat.

Die derde artikel beraam die impak van oorbetalings op die kwesbaarheid met verwagte armoede onder landbouhuishoudings in Gambië, Ghana en Nigerië. Ons het gevind dat huishoudings wat voordeel trek uit oorbetalings in al drie lande verbruik kan verminder om hul kwesbaarheid teen verwagte armoede te verminder en daarom teen toekomstige armoede te beskerm. Alhoewel stedelike huishoudings minder kwesbaar was as plattelandse huishoudings vir moontlike armoede, was landelike huishoudings wat oorbetalings ontvang het, minder kwesbaar vir verwagte armoede. Dit onderstreep die belangrikheid van oorbetalings in die verbetering van die welstand van armer huishoudings. Hierdie referaat dra by tot die literatuur deur die uitwerking van oorbetalings op die kwesbaarheid vir verwagte armoede van landbouhuishoudings te evalueer, om beter begrip van die dinamiese gedrag van huishoudings se verbruik in die toekoms te verskaf.

Die algehele gevolgtrekking van die studie is dat oorbetalings nie-arbeidsinkomste verskaf wat help om die welstand van landbouhuishoudings te verbeter, armoedevlakke te verminder en die kwesbaarheid van landbouhuishoudings vir verwagte armoede te verminder. Hierdie positiewe uitwerking van oorbetalings beïnvloed armer huishoudings meer. Aangesien landbouhuishoudings oor die algemeen onder die arm en kwesbare bevolking in SSA is, verskaf die studie bewyse dat oorbetalings help om die armoede en kwesbaarheid vir armoede onder die armes van die armes te verminder. Die studie beveel aan dat regerings in Afrika suid van die Sahara beleide moet instel wat 'n vermindering in die koste van die stuur van oorbetalings verseker aan veral landelike boerehuishoudings om verhoogde oorbetalingsvloei te verseker as 'n indirekte manier om kwesbaarheid vir verwagte armoede te verminder.

Sleutelwoorde

Oorbetaling, landbouproduktiwiteit, verwagte armoede, welstand, geneigdheid tot aanpassing, instrumentele veranderlike kwantielregressie.

DEDICATION

To my lovely wife Rita and my daughters Afra and Efua.

"Your majesty, there is no royal road to geometry"

- Euclid

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"The more grateful I am, the more beauty I see"

- Mary Davis

DECLARATION: LANGUAGE EDITING

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Dear Sir/Madam,

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I, Ewald Kruger, hereby declare that I have personally read through the research assignment of Mark Eghan and have highlighted language errors.

Yours sincerely

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28 July 2023

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ACRONYMS AND ABBREVIATIONS

3SLS	– three-stage least squares
ANRP	– Agriculture and Natural Resources Policy
ATE	– average treatment effect
ATET	– average treatment effect on the treated
CAADP	– Comprehensive Africa Agriculture Development Programme
CSIR	– Council for Scientific and Industrial Research
ECOWAS	– Economic Community of West African States
FASDEP I	– Food and Agriculture Sector Development Policy I
FASDEP II	– Food and Agriculture Sector Development Policy II
FAO	– Food and Agriculture Organization
FDI	– foreign direct investment
FGLS	– feasible generalized least square
GBOS	– The Gambia Bureau of Statistics
GDP	– gross domestic product
GMM	– generalised method of moments
GNI	– gross national income
Ha	– hectare
HDI	– human development indicators
HIES	– Household Income and Expenditure Survey
IHS	– Integrated Household Survey
IMF	– International Monetary Fund
IVQR	– instrumental variable quantile regression
kg	– kilogram
LSMS	– Living Standards Measurement Study
max	– maximum
min	– minimum
MoFA	– Ministry of Food and Agriculture
NELM	– new economics of labour migration
NNM	– nearest-neighbour matching
NPS	– National Panel Survey

ODA	– official development assistance
OLS	– ordinary least square
PPP	– purchasing power parity
PSM	– propensity score matching
SE	– standard error
SRID	– statistical, research and information department
SSA	– Sub-Saharan Africa
Std. Dev.	– standard deviation
UNDP	– United Nations Development Program
US\$	– United States Dollar
VEP	– vulnerability as expected poverty
VUER	– vulnerability as uninsured exposure to risk
VEU	– vulnerability as low expected utility
VIF	– variance inflation factor

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Remittances are increasingly gaining importance as a source of capital in developing economies and in particular their potential impact on recipient households is of interest to academics and policymakers. Over the past decade, there has been stable growth in the flow of international remittances to developing countries.

International remittances to developing countries in 2015 were estimated to be about \$454 billion accounting for the second largest source of external finance for developing countries after foreign direct investment (FDI) until 2020 when remittances rose to \$553 billion and became the largest source of external finance for developing countries following a 12% decline in FDI due to the declined global activity in the recession year 2020 (Ratha et al., 2022).

Apart from international remittances to receiving countries, domestic remittances in sub-Saharan Africa also provide very important sources of finance to the rural economy and help to develop the financial sector as well. For example, McKay and Deshingkar (2014) estimate that about R82 billion and N40.7 billion were internally remitted through financial institutions and money transfer institutions in South Africa and Nigeria respectively.

Data from the World Bank shows that remittances flow to developing countries is larger than official development assistance¹ (ODA) and relatively more stable than private capital flows. For example, in sub-Saharan Africa (SSA), the World Bank estimated a 14.1% growth in remittances to reach about \$49 billion in 2021 from \$43 billion in 2020. This is forecasted to increase by 5.5% in 2023. The growth of remittance flows to developing countries in 2021 was driven by migrants “wanting to send money to support their families facing hardships back home” (Ratha et al., 2022, p. 4) following the Covid-19 pandemic and enabled by host countries’ fiscal stimulus programmes to households.

¹ Comprises official payments by the DAC donor countries to developing countries with the primary objective of promoting economic and social development and satisfying particular criteria regarding their financing structure.

The macroeconomic impact of remittance flows on recipient countries in sub-Saharan Africa have been studied extensively in the literature, especially the effects of remittances on economic growth (see Stahl & Arnold, 1986; Massey *et al.*, 1999; Adenutsi, 2011).

The literature generally concludes on positive macroeconomic effects of remittance on receiving economies. For example, Adenutsi (2011) found that remittances are important determinant of economic growth in Ghana. Giuliano and Ruiz-Arranz (2009) found that remittances induce growth in less developed countries.

These macroeconomic impacts of remittances do not pay attention to the household level where migration (internal and external) and remittance decisions are taken. At the macro level, aggregate international remittances have the potential of transforming the structure of most sub-Saharan African countries as it accounts for over 20% of gross domestic product (GDP) in countries such as Liberia, Comoros and The Gambia, while accounting for between 10% and 15% in several sub-Saharan African countries.

The studies on microeconomic impacts of remittances are however limited and not conclusive in literature. Ghimire and Kapri (2020) note that there is limited research on the impact of remittances on agricultural productivity while Bang *et al.* (2016) note that there is less consensus regarding the extent to which remittances impact the most vulnerable population of the recipient country. The limited information applies to sub-Saharan Africa as well, for instance the majority of the labour force is engaged in agriculture, and remittance flow accounts for about 20% of GDP in some countries, yet little is known about the impact of remittance on agricultural productivity and welfare of agricultural households. In addition, remittance can increase household income, thereby inducing investment with the additional income received.

Remittances are very important in affecting the household consumption of receiving households. As household incomes increase due to additional financial resources received through remittances, households can purchase enough food to meet their dietary needs. Furthermore, remittances could have welfare-improving implications. Improvement in household consumption is an indicator of welfare; in addition, households can increase their asset accumulation using remittances to purchase these assets. Taylor (1992) established an indirect relationship between remittances and asset

accumulation in rural Mexico. The more productive the accumulated assets using remittances, the more income and wealth will be created thereby increasing the welfare of these households. Other welfare indicators that remittances could impact positively are increased education enrollment and enhanced access to healthcare.

Many households in rural sub-Saharan Africa face credit constraints. Access to credit is very important to increase agricultural productivity. As households access credit facilities, they can buy agricultural inputs for further production. To overcome these credit constraints, some households invest in sending a family member abroad or to bigger cities. The remittances from a member who lives away from home help the household to overcome these credit constraints since they can access capital without necessarily borrowing from a money lender or financial institution.

This study makes significant contributions to the existing literature on remittance flows in sub-Saharan Africa by assessing the relationship between remittances and agricultural development to further understand the impacts of remittances on agricultural households. Specifically, the study contributes to knowledge by examining whether the effect of remittances on agricultural productivity vary by the nature of crop production. The innovation in this analysis is the disaggregation of the effect of remittance on productivity based on the tradability of the crop.

Again, most of the existing studies on the effect of remittances on welfare assume that the effect of remittance along the distribution of household consumption is the same (Keho, 2017). This study adds to the literature by estimating the distributional effect of remittances on agricultural households' welfare. The understanding of the effect of remittances on different segment of income distribution of the population, especially the lower tail, helps to explain the distributional benefits of remittance rather than using the mean income levels of a population. The study further contributes to literature by assessing the effects of remittances on the vulnerability to expected poverty of agricultural households, and to provide better understanding of the dynamic behaviour of households' consumption in the future.

The study uses recent household survey data from three sub-Saharan countries, Ghana, The Gambia and Nigeria for analysis and discussions. The Gambia has the second highest

share of remittance contribution to GDP (about 15.6%) after Lesotho, while Nigeria accounts for 40% of remittances received in sub-Saharan Africa (Ratha et al., 2021). Ghana receives the second largest remittances in absolute amounts in sub-Saharan Africa (Ratha et al., 2021). Among the top recipient countries of remittances in sub-Saharan Africa, Nigeria and Ghana accounted for 48.47% of remittance flow to the region, making West Africa an important remittance destination (Ratha et al., 2021).

These facts demonstrate the relevance and importance of remittances to the economies of these countries. All three countries are largely agrarian, as the agricultural sector employs more than 50% of the labour force and contributes to over 20% of GDP.

In addition, the three countries have similar climatic conditions and are all within the Economic Community of West African States (ECOWAS). These characteristics allow the study to compare the effects of remittances on the selected outcome variables in the three countries.

The selection of these three countries is further motivated by the availability of remittances and agriculture themes in their Living Standards Measurement Study (LSMS) datasets. Since the survey methodologies of LSMS is similar across the countries, the study limited the data sources to the LSMS only to allow for cross-country comparisons.

1.2 THE RESEARCH PROBLEM

The New Economics of Labour Migration (NELM) hypothesises that remittance from migration is a strategy to reduce financial liquidity constraints of rural households (Stark & Bloom, 1985). Other theories of remittance such as the altruistic motive of remittance also show that remittances provide the recipient with options to smoothen consumption during shocks, yet the investment or portfolio management decision theory of remittances supports the view that remittances behave like capital flows for investment expansion (Lucas & Stark, 1985; Elbadawi et al., 1992). A number of studies have tested most of these theories with some mixed results. Some studies found that remittances did not improve agricultural production (Harden, 1996; Jokisch, 2002; Tuladhar et al., 2014; Lim & Simmons, 2015) while other studies found positive impacts of remittances on household capacity to invest in agriculture and increase in production (Stark, 1980;

Rozelle et al, 1999; de Hass, 2006). The inconclusive findings indicate the relationship between remittance and productivity is complex and may vary with specific local conditions (Akpan et al., 2014). The majority of these studies were carried out mainly from Latin America and Asia with few in sub-Saharan Africa (see Zahonogo, 2011; Akpan et al., 2014; Dedewanou & Tossou, 2022) and as is noted by Ghimire and Kapri (2020) there is limited research on the impact of remittances on agricultural productivity.

The inconclusive findings on the effects of remittances on agricultural productivity in the global literature may be due to some heterogeneous effects and conditions, like crop type under cultivation, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities. However, the existing literature do not account for the effect of heterogeneity in economic activities of agricultural households, creating a gap in the literature. Differences in local conditions, such as heterogeneous agro-ecological zones could influence smallholder farmers to opt for more than one crop farming to allow for spreading of risk from failure or low productivity from mono crop farming and to diversify income.

Similarly, some smallholder farmers also engage in non-farm enterprise activities for diversification of activities, risk, and income sources. The effect of remittance on agricultural productivity may also depend on whether the farmer has other crops and or involved in other non-farm enterprise activity. These interaction effect of these heterogeneous economic activities and remittance on agricultural productivity can help to better understand the effect of remittance on agricultural productivity, thereby closing a gap in the literature.

Given the limited research on the effect of remittances on agricultural productivity in sub-Saharan Africa, there was an opportunity to examine whether remittances are able to improve agricultural productivity in sub-Saharan Africa via the relaxation of credit constraints facing agricultural households.

When credit constraints are relaxed due to exogenous remittance receipts, households can afford agricultural technology which is essential for improving agricultural productivity (Rozelle et al., 1999; Zahonogo, 2011; Tuladhar et al., 2014). Recognising credit constraints as a major challenge to financing agriculture in Africa, it was important to

explore whether remittances could provide finance to overcome these credit constraints. This credit challenge impacts the level of agricultural investments, thereby preventing agricultural commercialisation in Africa without which smallholder farmers will be unable to escape poverty.

The impact of remittances on household welfare is also not conclusive in the literature. Some studies did not find a positive impact of remittances on household welfare (Andersson, 2014; McKenzie & Rapoport, 2006) while others found a positive impact of remittances on welfare using several indicators such as consumption, health, education expenditure, child growth, etc. (Ratha, 2003; Adams, 2006; Airola, 2007). Most of these studies also found that remittances have a positive impact on asset accumulation through increased investment spending over consumption (Zarate-Hoyos, 2004; Adams, 2006; Taylor & Mora, 2006) and a shift in household spending from less productive to more productive assets (Chiodi et al., 2012). However, when remittance receipts are spent on luxuries and other non-productive assets, remittances have no effect on welfare (Clément, 2011).

One of the key assumptions in the existing literature is that the effect of remittance receipt on household welfare is the same along the distribution of household consumption levels and hence does not account for the distributional income/welfare effect of remittances.

Bang et al. (2016) noted that there is less consensus regarding the extent to which remittances impact the most vulnerable population of the recipient country which presupposes that the effect of remittance could be distributed according to household income levels. This dynamic effect is often hidden in regression concentrating on the average of the income distribution. Examining this dynamic effect will help close the gap in the literature concerning the impact of remittances on household welfare along the distribution of household income levels.

While studies on vulnerability in Africa have focused mainly on the general population, farming households at risk of income fluctuations have not been studied in depth (Adams & Page, 2005; Adams & Cuecuecha, 2010; Bogale, 2012; McCarthy et al., 2016). Although remittance affects poverty, and vulnerability to poverty through similar channels of asset accumulation, consumption smoothing, investment and risk mitigation,

available evidence largely focuses on remittances and poverty, but little is known about remittances and vulnerability to expected poverty and which presents another gap in the literature to be studied. Sub-Saharan Africa's poverty is chronic and transitory (Christiaensen & Hill, 2019).

Households are dynamic and can therefore get out, remain, or fall into poverty depending on several factors. The latter two situations, "remaining poor" and "falling into poverty", are primarily due to structural conditions such as a lack of assets, limited access to public goods and services, and lack of income-earning opportunities (Christiaensen & Hill, 2019). Remittance flows to households could relax the "lack of income-earning opportunities" constraint facing households enabling it to escape poverty.

One of the major challenges confronting the SSA agricultural sector is the low investment funding to the sector. The African Union, recognizing low investment in agriculture, launched the Comprehensive Africa Agriculture Development Program (CAADP) in 2003 to stimulate investment in agriculture on the continent by increasing public funding to agriculture. Within the CAADP framework, African governments committed to allocate at least 10% of their national budget to agriculture sector. However, due to fiscal challenges and lack of public funding several countries including Ghana, The Gambia and Nigeria have not been able to allocate at least 10% of their national budget to agriculture.

As can be seen in Table 1.1, the share of agricultural spending in government expenditure across the sub-regions of Africa has been below 10% since 2001 to 2020 with some of the sub-regions such as Central Africa recording as low as an average of 0.82% of national budget on agricultural spending. The low public spending in Agriculture indicates that the traditional sources of public financing and investment in sub-Saharan agriculture is not sufficient to finance the productivity and growth levels targeted. It is therefore imperative to identify alternative sources of finance to drive the needed investment in the agricultural sector.

The alternative sources of finance into agriculture have the potential to crowd in private investment into agriculture thereby driving agricultural innovation and technology adoption to increase productivity.

Table 1.1: Share of agriculture expenditure in government budgets by region (%)

Region	2001	2005	2010	2015	2020
Eastern Africa	4.56	6.33	6.98	4.25	3.47
Northern Africa	3.52	3.48	2.39	2.69	2.94
Central Africa	1.79	1.97	1.27	0.96	0.82
Southern Africa	1.93	1.91	1.86	1.58	1.46
Western Africa	3.65	4.20	3.02	2.52	3.06
Africa	3.06	3.08	2.57	2.46	2.55

Source: FAO, 2021

Remittances flow from migrant workers to Africa has shown a steady growth over the past three decades, and thus can be a source of steady finance for the agricultural sector. Remittance flow to sub-Saharan Africa has recorded a positive trend over the last two decades rising from US\$ 5 billion in 2000 to about US\$ 49 billion in 2021 (Ratha et al., 2022). The impact of remittance on agricultural household welfare and farm productivity is very important to study in Africa because farming households are among the poorest in Africa and, in addition, very vulnerable to shocks such as crop failure due to climate change and the unavailability of developed insurance schemes to mitigate their risks.

In order to explore the phenomenon of remittances the thesis will consist of three related stand-alone essays to examine the effects of remittances on agricultural development, using agricultural households' welfare, productivity and expected poverty respectively as outcomes of interest for the study.

1.3 RESEARCH QUESTIONS

From the preceding discussions, the pertinent questions that the study seeks to answer are:

1. Does heterogeneity in economic activity of farming households affect the effects of remittances on tradable and non-tradable crop productivity?
2. How do remittances impact on agricultural households' welfare?
3. Do agricultural households use remittances to reduce vulnerability to expected poverty?

1.4 RESEARCH OBJECTIVES

The main objective of the study is to assess the relationship between remittance flows to households in sub-Saharan Africa and agriculture development. The specific objectives are:

1. To assess the impact of remittances on agricultural productivity in Ghana.
2. To examine whether heterogeneity in economic activity of farming households affects the effects of remittances on productivity of tradable and non-tradable crop farming households in Ghana.
3. To assess the impact of remittances on agricultural household welfare in The Gambia.
4. To identify the impact of remittances on welfare along the distribution of household consumption.
5. To examine the relationship between remittances and household expected poverty.

1.5 RATIONALE FOR EACH ESSAY

Three empirical essays answering the three research questions constitute the main research output from the thesis. It is important to note that each empirical paper contains strong justification and motivation. Each of the three empirical papers is presented as a standalone chapter.

The existing literature on the microeconomic impacts of remittances are limited and not conclusive in sub-Saharan Africa. These inconclusive findings in the global literature coupled with very limited research on the subject pertaining to sub-Saharan Africa may be as a result of some heterogeneous effects and conditions that are not accounted for in the existing literature. Differences in local conditions such as variations in the agro-ecological zones could influence changes in economic activities which can affect the effect of remittances on agricultural productivity.

The first empirical essay (Chapter 3:) aimed to fill this gap by examining the effect of remittance on agricultural productivity in Ghana by assessing the interaction effects of remittance and heterogeneity in economic activities on agricultural productivity.

This chapter tests whether remittance provides resources to farming households to relax liquidity constraints they face. The chapter distinguishes its contribution to literature by distinguishing the paper from others by controlling for crop types (particularly tradeable or otherwise and gestation period), farming of a second or more crops, and engagement of smallholder farmers in non-farm economic activities.

The study has important policy implications in sub-Saharan Africa since the structure of agriculture sector is similar across countries in the subregions with problems of low productivity. The study provides new empirical evidence on the impact of remittances on agricultural productivity in sub-Saharan Africa.

The effects of remittances on household welfare are not the same along the distribution of household consumption levels. Yet existing literature assumes that the effect is the same without accounting for the distributional income/welfare effect of remittances. Bang et al. (2016) noted that there is less consensus regarding the extent to which remittances impact the most vulnerable population of the recipient country.

The second empirical essay (Chapter 4:) examines the questions:

- (1) Can remittances enhance the welfare of households in The Gambia?
- (2) What is the distributional effect of remittance on agricultural households' welfare in The Gambia?

Understanding the effects of remittances on different segments of income distribution of the population, especially the lower tail, will explain the distributional benefits of remittance than on the mean income levels.

In The Gambia, the agriculture sector accounts for about 80% of the primary source of livelihood for the rural population. Therefore, when the welfare levels of farming households improve, it will have significant impact on the poverty alleviation efforts by the government. The Gambia is one of the highest recipients of remittances on a per capita basis.

Despite the high inflows of remittance and high poverty levels in The Gambia, the empirical literature provides very little knowledge about the impact of remittance on welfare and which segment of the income group benefits most from remittances. The

second essay therefore helps to provide evidence and sheds new light on the distributional impact of remittance along income levels.

The literature studying vulnerability in Africa have focused mainly on the general population, while farming households who are at risk to income fluctuations and among the poor have not been studied in depth (Adams & Page, 2005; Adams & Cuecuecha, 2010; Bogale, 2012; McCarthy et al., 2016).

Although remittance affects poverty and vulnerability to poverty through similar channels, available evidence largely focuses on remittances and poverty, but little is known about remittances and vulnerability to expected poverty. Remittances help households to manage their exposure to income risks and improve household welfare through income and consumption smoothing, asset accumulation and insure them against shocks (Adams, 1998; Jones, 1998; Amuedo-Dorantes & Pozo, 2014; Sayeh & Chami, 2020).

Poverty is not static but a dynamic concept; a household can move out of poverty or move into poverty in different time periods. To better understand the dynamic nature of poverty among households, it is important to use vulnerability to expected consumption to predict the future poverty status of households which will provide evidence for designing social protection and poverty alleviation strategies.

The third empirical essay (Chapter 5:) of the thesis examines the factors that affect agricultural households' vulnerability to expected poverty in Ghana, The Gambia and Nigeria.

Firstly, changes in the number of remittances affect the income levels of recipient households and their expenditure patterns. It is important to understand the determinants of remittances so that targeted policies can be implemented when there is an economic shock in the remittance sending-countries. The study's outcome will contribute to policy discussions and interventions for reducing the cost of sending remittances in sub-Saharan Africa where the costs associated with remittances are high compared to other regions of the world.

Secondly, it is important to study the impact of remittances to assess their contribution to development because it is the second largest capital inflow to sub-Saharan Africa. The study's findings will provide new evidence for policymakers to promote policies that will increase the flow of remittance to the continent.

1.6 CHAPTER ORGANISATION

The study consists of six chapters.

Chapter 1: presents the background and motivation for the study. It also introduces the research questions and objectives underpinning this study.

Chapter 2: discusses the overview of remittances in sub-Saharan Africa. The chapter presents the trends and cost of sending remittances in sub-Saharan Africa as well as an overview of agricultural productivity in sub-Saharan Africa. It also provides the contextual background for the empirical studies in the subsequent chapters.

Chapter 3: presents the essay on remittances and agricultural productivity in Ghana by looking at the effects of remittances on agricultural productivity. It also explores whether the effect of remittances on agricultural productivity varies by the type of crop production and if heterogeneity in the economic activity of farming households affects the impact of remittances on the productivity of the crops.

Chapter 4: presents the second empirical essay on the impact of remittances on agricultural households' welfare in The Gambia.

Chapter 5: examines the relationship between remittances and the expected poverty of households in Ghana, The Gambia and Nigeria.

Chapter 6: presenting the summaries of the major research findings, the conclusions and policy recommendations, as well as recommendations for future studies.

CHAPTER 2: OVERVIEW OF MIGRATION, REMITTANCES, AND AGRICULTURAL PRODUCTIVITY IN SUB-SAHARA AFRICA

2.1 INTRODUCTION

This chapter presents an overview of migration in SSA including the drivers of migration, the trends and cost of sending remittances as well as an overview of agricultural productivity. As such this chapter presents the contextual background for the empirical papers presented in the subsequent chapters.

Migration, whether national or international is an important livelihood strategy among households in most developing countries. It is estimated that there are about 40.5 million migrants from Africa (UN DESA, 2020). Migration within Africa is predominantly driven by social, economic, security and political factors in both host country and country of origin, along with cultural links and environmental factors such as droughts or floods, while migration of sub-Saharan Africans to the rest of the world is driven mainly by the search for better economic opportunities, and the primary destinations are advanced economies (Gonzalez-Garcia et al., 2016).

Migrant workers can have a positive impact on the socio-economic conditions of families left behind in their country or town of origin in the case of international and national migration, respectively. The remittances that are sent back home continue to provide sources of finance for livelihoods and investments.

Literature provides varied theories to explain the rationale behind migrants' decisions to remit money back home. Following a review of the literature, four main theories have been identified to explain the motivations for remittances; (i) the altruistic, (ii) self-interest, (iii) loan repayment, and (iv) investment or portfolio management decision theories (Johnson & Whitelaw, 1974; Lucas & Stark, 1985; Solimano, 2003; Chami et al., 2005). The four theories identified above can be further classified into two main strands: the "endogenous migration" and "portfolio" approaches (Elbadawi et al., 1992).

The endogenous migration approach is based on the family's decision making, which is not necessarily limited to the altruism motive for remittance. The portfolio approach is a more personal approach independent of family ties as it distinguishes the decision to remit from the decision to migrate. Some studies suggest that the portfolio approach is an informal theory of remittances that supports the view that remittances behave like capital flows (Elbadawi et al., 1992).

However, a close examination could also suggest the endogenous migration approach as another informal theory to explain remittances as a capital flow especially if the decision to invest with the remittances received will be made by the receiving family (household). Gupta et al. (2009) stated that the impact of remittances on economic growth is largely influenced by the decision of receiving households on how to use the remittances; for consumption or investment. This will make capital available for investment and other developmental purposes. Both the endogenous and the portfolio approaches are relevant to this study.

The rest of the chapter is organized as follows: Section 2.2 presents stylised facts on migration in SSA including the drivers of migration and general socio-economic consequences of migration in SSA, while Section 2.3 presents the stylised facts on remittances including the trends and cost of sending remittances in sub-Saharan Africa. Section 2.4 presents an overview of agricultural productivity in sub-Saharan Africa, and Section 2.5 concludes the chapter.

2.2 STYLISED FACTS ON MIGRATION IN SUB-SAHARAN AFRICA

The stock of international African migrants has been increasing steadily for the past two decades increasing from 20.6 million in the year 2000 to 40.5 million in 2020 (UN DESA, 2020). As shown in Table 2.1, Eastern Africa had the highest number of migrants in the early 1990s with estimated migrant stock of 7.78 million. However, over the past two decades, Northern Africa has recorded the highest number of migrants, followed by Eastern Africa. The number of migrants from Southern Africa has remained at an all-time low. The reasons for the migration stocks will be discussed under section 2.2.2 below. About 69.72% migrant stock in Africa are from sub-Saharan Africa (28.28 million people) (UN DESA, 2020).

In terms of growth of the migration stock, the number of migrants across all regions of Africa except East Africa have doubled in numbers in the year 2020 compared with the 1990 estimates. Overall, the migrant stock on the continent has recorded consistent upward growth levels over the past 3 decades.

Table 2.1: International migrant stock, 1990-2020 (Source of data : UN DESA, 2020)

Origin	Number of migrants						
	1990	1995	2000	2005	2010	2015	2020
Eastern	7,784,743	7,734,774	6,079,992	6,192,747	7,524,192	9,824,290	12,027,289
Middle	1,922,243	1,857,602	2,439,360	2,726,556	3,007,543	3,816,990	4,420,662
Northern	5,286,657	5,852,421	6,441,989	7,966,421	9,251,128	10,914,748	12,282,625
Southern	576,752	604,456	732,312	904,614	1,199,813	1,129,951	1,278,435
Western	5,051,069	6,292,141	6,386,350	7,451,068	8,211,176	9,425,980	10,558,152
Sub-Saharan	15,334,807	16,488,973	15,638,014	17,274,985	19,942,724	24,197,211	28,284,538
Africa	20,621,464	22,341,394	22,080,003	25,241,406	29,193,852	35,111,959	40,567,163

Several factors influence migration in Africa. Migration within Africa is predominantly driven by factors such as geographic proximity, income differences, wars in the home country, and relative political stability in the host country, along with cultural links and environmental factors such as droughts or floods. Migration of sub-Saharan Africans to the rest of the world is driven mainly by the search for better economic opportunities, and the primary destinations are advanced economies (Gonzalez-Garcia et al., 2016).

Climate change is influencing migration in Africa as well. The rise in global temperature in some parts of Africa makes living conditions in those areas difficult for the inhabitants. For example, the drought in the Horn of Africa caused by climate change has resulted in water scarcity and loss of human life including crops and livestock, thereby forcing the remaining inhabitants to migrate elsewhere in search for favourable and safe environment. Other environmental factors driving migration in Africa are disasters particularly relating to floods.

It is important to note that the majority of migrants from sub-Saharan Africa migrate to other countries on the continent. Over 80% of migrants from SSA migrates within SSA (see Table 2.2). About 85% of the sub-Saharan African diaspora in the rest of the world are in countries belonging to the Organization for Economic Cooperation and Development (OECD) with the United States, the United Kingdom, and France hosting about 50% of sub-Saharan African migrants (Gonzalez-Garcia et al., 2016).

Table 2.2: Regional destination of SSA migrants (Data Source : UN DESA, 2020)

Region of destination	Number of SSA migrants
Sub-Saharan Africa	17,808,594
Northern Africa and Western Asia	1,239,160
Central and Southern Asia	128,690
Eastern and South-Eastern Asia	51,394
Latin America and the Caribbean	30,679
Oceania (excluding Australia and New Zealand)	2,068
Australia and New Zealand	11,054
Europe and Northern America	527,437

Within SSA the top five destination countries on the continent are South Africa, Côte d'Ivoire, Uganda, Sudan and Nigeria. Given the relative size of their economies, these countries reveal the position of their economic strength for their respective sub regions. With the exception of Côte d'Ivoire, migrants make up less than 5 percent of the population in each of the top 5 destination countries. Most migrants in Côte d'Ivoire are from neighbouring Burkina Faso, with which it shares common cultural attributes (Traoré & Torvikey, 2022).

Table 2.3: Top 10 African destination countries by number of migrants (Data Source: UN DESA, 2020)

Country of destination	Immigration population	Percentage of population
South Africa	2,860,495	5
Cote d'Ivoire	2,564,857	10
Uganda	1,720,313	4
Sudan	1,379,147	3
Nigeria	1,308,568	1
Ethiopia	1,085,517	1
Kenya	1,050,147	2
Dem. Rep. Congo	952,871	1
South Sudan	882,252	8
Libya	826,537	12

2.3 STYLISTED FACTS ON REMITTANCES

2.3.1 Remittance trends in sub-Saharan Africa

There has been a sharp increase in the global remittance flow to developing regions over the past two decades where remittance flows grew from US\$ 73 billion in the year 2000 to US\$ 467 billion in 2010 (Ratha et al., 2022). The global remittance flow had been increasing consistently up to US\$ 719 billion in 2019 and the World Bank forecasts this amount to reach US\$ 843 billion in 2023. Similarly, remittance flow to sub-Saharan Africa has recorded a positive trend over the last two decades rising from US\$ 5 billion in 2000 to about US\$ 49 billion in 2021.

Figure 2.1 shows the trends in remittance flow compared to other capital flows to sub-Saharan Africa and it can be established that remittances are relatively stable as compared to the volatility in other capital flows, as well as that the general trend of remittance flow has been positive since 1990.

Another capital flow to sub-Saharan Africa that shares similar less volatile growth characteristics with remittance, is Official Development Assistance (ODA) which has also recorded a positive trend since 2000.

Foreign Direct Investment (FDI), private debt and portfolio equity have exhibited unstable paths since 1990 and the volatility increased following the 2007/2008 financial crises. Despite the financial crises, remittance flow was resilient and stable with positive growth (see Figure 2.1). During the financial crisis, remittances to developing countries declined by 5%. However, this decline was recovered after one year to record positive growth.

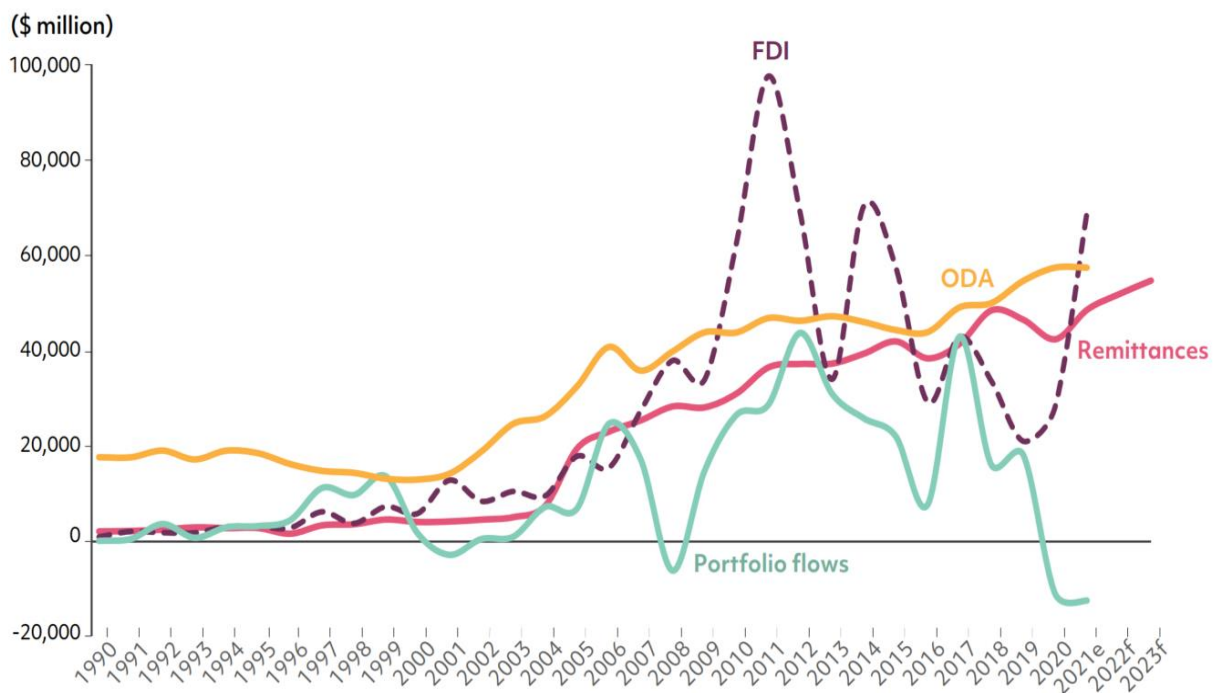


Figure 2.1: Trends in remittances and other capital flows to sub-Saharan Africa (Ratha et al., 2022)

Note: FDI = foreign direct investment; ODA = official development assistance; e = estimate; f = forecast.

The growth rate of remittances in sub-Saharan Africa has recorded positive growth rates from 2000 until 2016 when growth rate of remittance fell by 8.5% due to slow economic

growth in remittance sending countries and increased use of informal channels due to exchange rate regimes in countries including Nigeria.

Growth recovered in 2017 and increased by 17.0% in 2018 but decreased in 2019 and decreased further in 2020 due to the impact of Covid-19 pandemic that resulted in general economic slowdown. This decrease in remittances to sub-Saharan Africa was primarily driven by a 27.7% decline in remittance flow to Nigeria (Ratha et al., 2021). Even though the growth in remittance receipts to sub-Saharan Africa decreased in 2019 and 2020, the volumes of remittances received were still above the 2017 volumes.

In 2021, the estimated remittance flow to sub-Saharan Africa grew by 14.1%. Ratha et al. (2022) notes that, a major contributing factor to this growth in 2021 was primarily due to increase in remittance flow to Nigeria because of the introduction of Naira-4-Dollar policy launched by the Central Bank of Nigeria in March 2021.

The Naira-4-Dollar policy increased remittance payments through formal channels to Nigeria, resulting in 11.2% growth in Nigeria's remittance receipts. The Naira-4-Dollar policy offered a N5 reward for every US\$ transferred through the banking system. The resulting increase in remittance flow to Nigeria accounted for almost one-third of total remittance flow to sub-Saharan Africa, hence the growth recorded for Nigeria influenced the positive growth of remittance receipt in sub-Saharan Africa in 2021. Remittances to Sub-Saharan Africa are projected to rise by 7.1% (US\$ 53 billion) and 5.5% (US\$ 55 billion) at the end of 2022 and 2023 respectively.

The global remittance flow has shown resilience despite the impact of Covid-19 by maintaining a positive trend. Similar to the 2007/2008 financial crisis, remittances have proven to be more resilient during a crisis than other global capital flows.

The flow of remittances to sub-Saharan Africa varies from country to country, both in absolute terms and relative to GDP. For example, about 40% of remittances received in sub-Saharan Africa went to Nigeria. Lesotho recorded the highest remittances to GDP ratio in the region at 20.6% followed by The Gambia at 15.6% and Cabo Verde at 13.9% (Figures 2.2 and 2.3).

A steady increase in remittances may be due to lower cost, expansion in the set of countries reporting remittances, and unabated migration to developed countries in search of a better life (Todaro & Smith, 2009). Another factor may be due to improvement in the economic and political structure at home (Catrinescua et al., 2009). These factors and the institutional environment of countries may interact and make remittances suitable for longer-term development purposes (Lartey & Mengova 2016).

Table 2.4: Estimates and projections of remittance flows to sub-Saharan Africa

Year	Volume (\$ billion)	Growth rate (percent)
2015	42	6.5
2016	39	-8.5
2017	42	8.1
2018	49	17
2019	47	-4.3
2020	43	-8.1
2021e	49	14.1
2022f	53	7.1
2023f	55	5.5

Source: Ratha et al., 2022

Note: e = estimate; f = forecast.

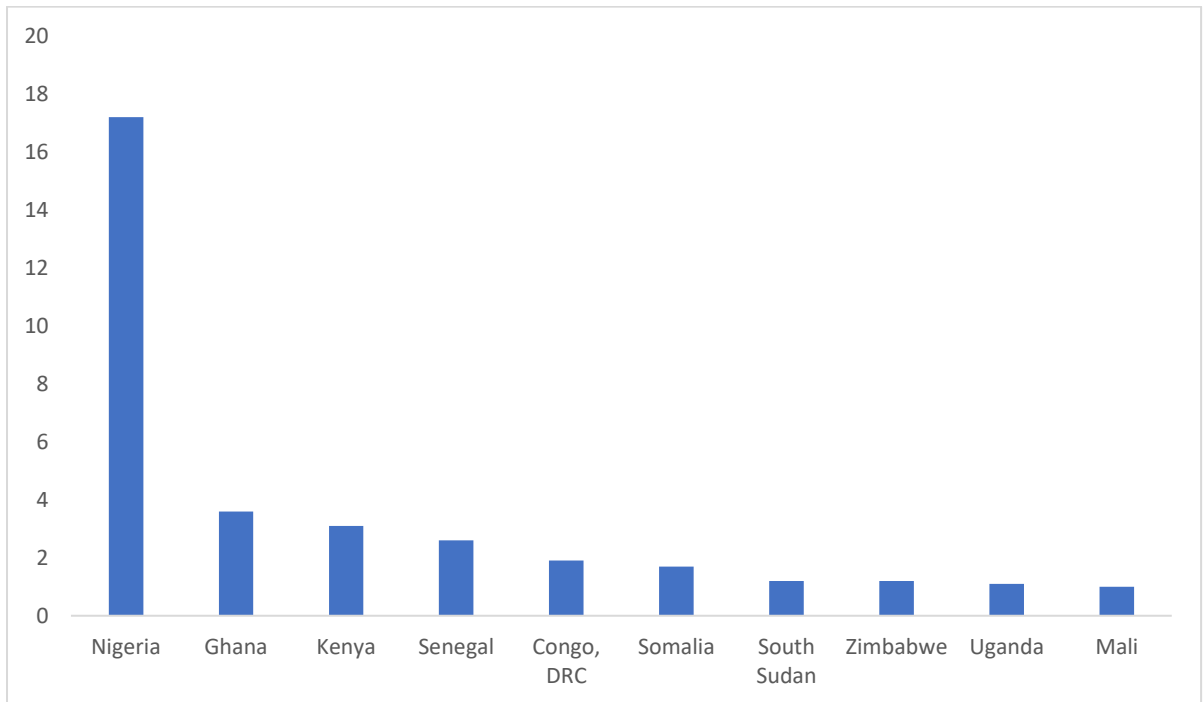


Figure 2.2: Annual remittances (\$ billion) (Ratha et al., 2021)

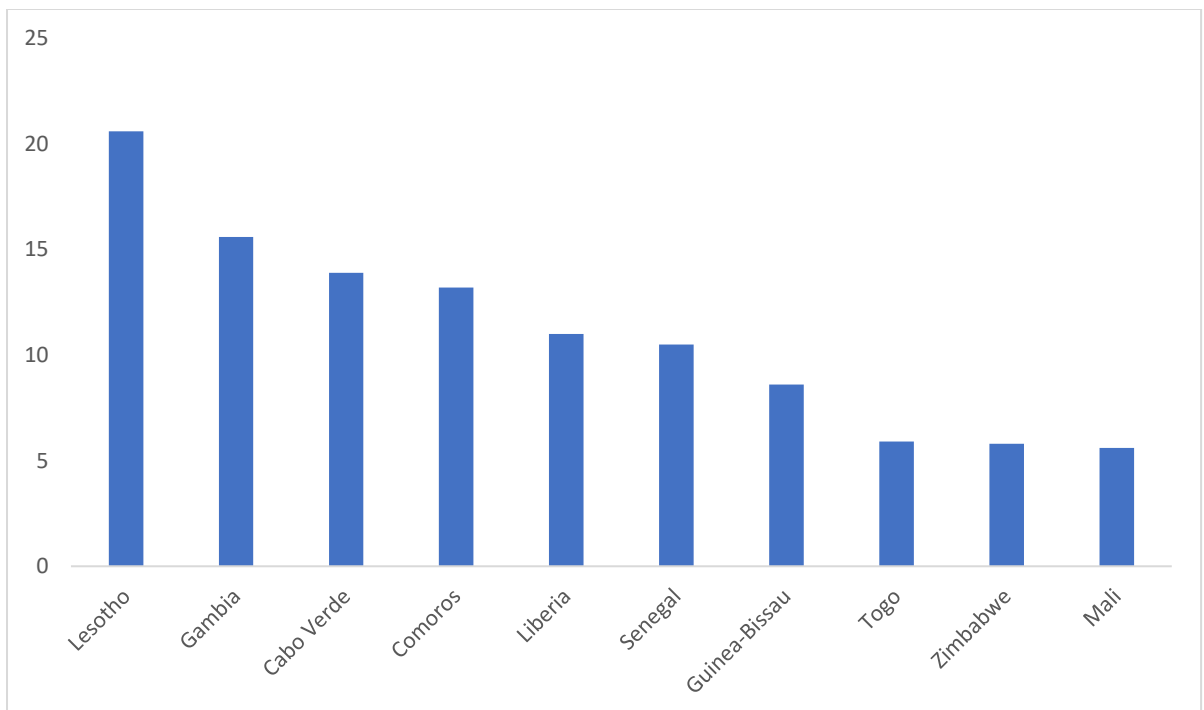


Figure 2. 3: Share of remittance to GDP (%) (Ratha et al., 2021)

2.3.2 Cost of sending remittance in sub-Saharan Africa

The cost of sending remittances to sub-Saharan Africa is the highest followed by the Pacific Island countries (Ratha et al., 2021). According to Ratha et al. (2022), the average cost of sending remittances in sub-Saharan Africa reached 7.8% in the fourth quarter of 2021. Some of the countries of origin with high cost of sending remittance are Tanzania and South Africa. For example, in first quarter of 2021, the highest cost of sending remittance was recorded from Tanzania to Kenya routes (31%). These high costs may discourage remittances and the associated development impacts in the subregion.

Figure 2.4 shows the least and most expensive cost corridors for sending remittances to sub-Saharan Africa countries. Remittance sent to Mali is less than 5% and being the least expensive remittance destination country in sub-Saharan Africa. The average cost of sending remittance in the least expensive corridors is estimated at 3.4% while the average cost of sending remittance in the most expensive corridors is 31.5%.

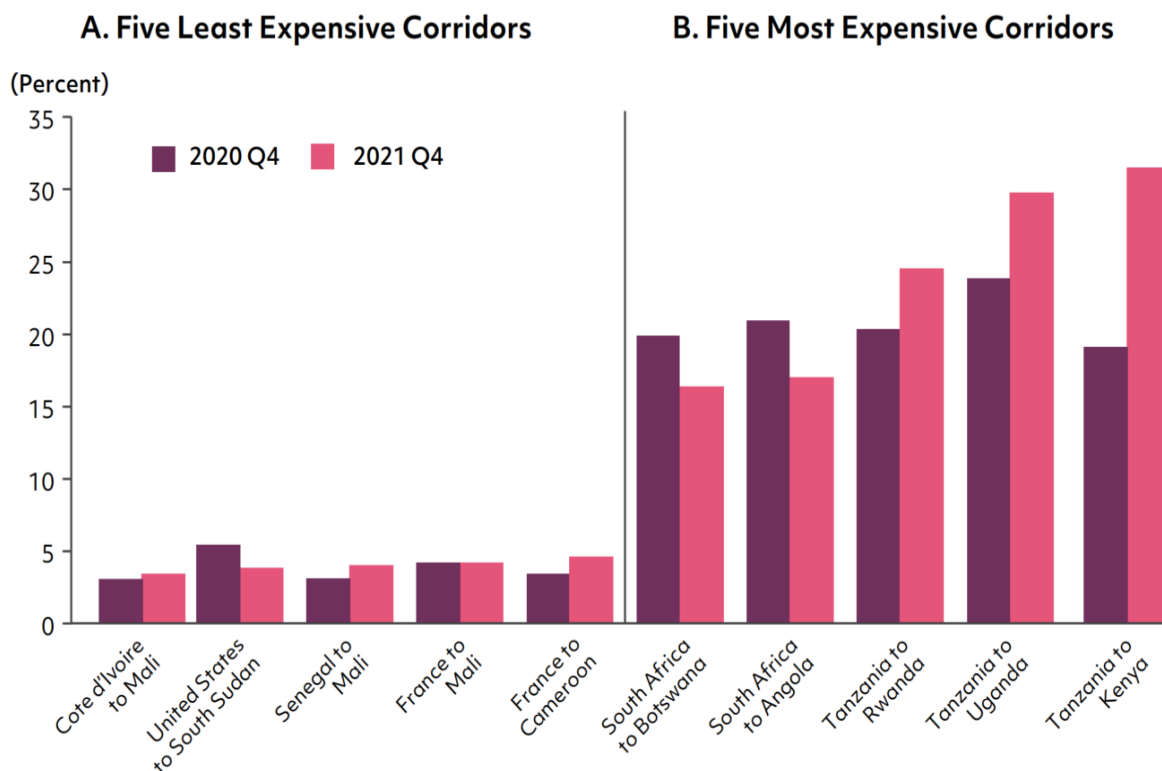


Figure 2.4: Cost of Sending Remittances to Sub-Saharan Africa Countries (Ratha et al., 2022)

2.4 AGRICULTURAL PRODUCTIVITY IN SUB-SAHARA AFRICA

Agriculture is one of the primary sectors contributing to the Gross Domestic Product of countries in sub-Saharan Africa. It is estimated that about 60% of the African labour force are engaged in the agriculture sector. On average, agriculture contributes about 18.6% of GDP, ranging from 2.24% in Seychelles to about 54% in Chad (Figure 2.5).

Compared with other regions, agriculture contribution to GDP in sub-Saharan Africa is the highest followed by South Asia (16.7%) with North America having the least share (1.1%). From Figure 2.5, it is evident that the agriculture sector is a major contributor to economic development in sub-Saharan Africa.

The wide range of the share of agriculture contribution to GDP also reveals the diverse economic structure on the continent. As evident in the generalized model of structural transformation, countries that have a large share of labour in agriculture derive the largest share of their GDP from agriculture (Timmer, 2009). It is well established that achieving higher agricultural productivity and increasing agricultural growth in Africa are strategies for overall development in the continent (Lewis, 1954; Hayami & Ruttan, 1971; Hazell & Haggblade 1991; World Bank 2007). Because the majority of the labour force is engaged in agriculture, increasing agricultural productivity can be a way of alleviating poverty and increasing incomes in sub-Saharan Africa.

The global demand for food is estimated to increase by 60% by 2050 compared with 2005 food demand (Van Ittersum et al., 2016). Sub-Saharan Africa is expected to have a greater rise in food demand due to the high population growth rate. Van Ittersum et al. (2016) estimated that the population of sub-Saharan Africa will increase by 2.5 folds with demand for cereals tripled by the end of 2050. This expected increase in demand for food requires sustained increases in agricultural growth in sub-Saharan Africa.

Agricultural growth in sub-Saharan Africa has been driven primarily by expanding land area under cultivation, in contrast with Asia and South America where agricultural growth were driven by intensification and mechanisation respectively (OECD-FAO, 2016). Despite large labour force involved in agriculture in sub-Saharan Africa, the productivity per agricultural worker has marginally improved by a factor of 1.6 in Africa over the past three decades, compared to 2.5 in Asia (OECD-FAO, 2016).

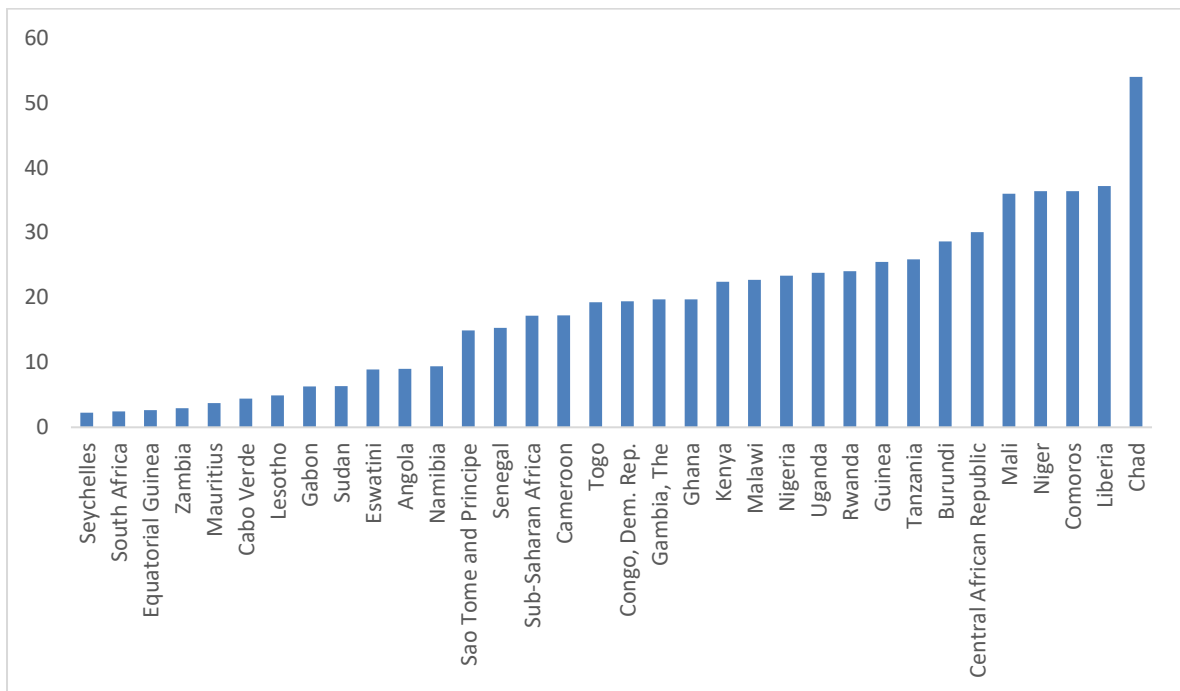


Figure 2.5: Agriculture as a share to total GDP in 2021

Agricultural productivity in sub-Saharan Africa remains lower than other regions of the world. Given the relative high contributions of agriculture to GDP ratio in sub-Saharan Africa, improvements in agricultural productivity are critical for the transformation of African economies.

The average yield of cereals in sub-Saharan Africa, excluding South Africa, has doubled from 0.8 ton/Ha in 1961 to 1.6 ton/Ha in 2020 (Figure 2.6). The increase in cereal yields has been slower than other regions of the world (Giller et al., 2021), with average yield levels of about 20% of the potential yields (Van Ittersum et al., 2016).

The cereal yield of Southern Africa is mainly driven by the yields of South Africa (5.4 ton/Ha) and Mauritius (9.05 ton/Ha), which is competitive with the global average yields. The yield gaps and the rapid growth in population presents an opportunity to increase the productivity of African Agriculture for the expanded market.

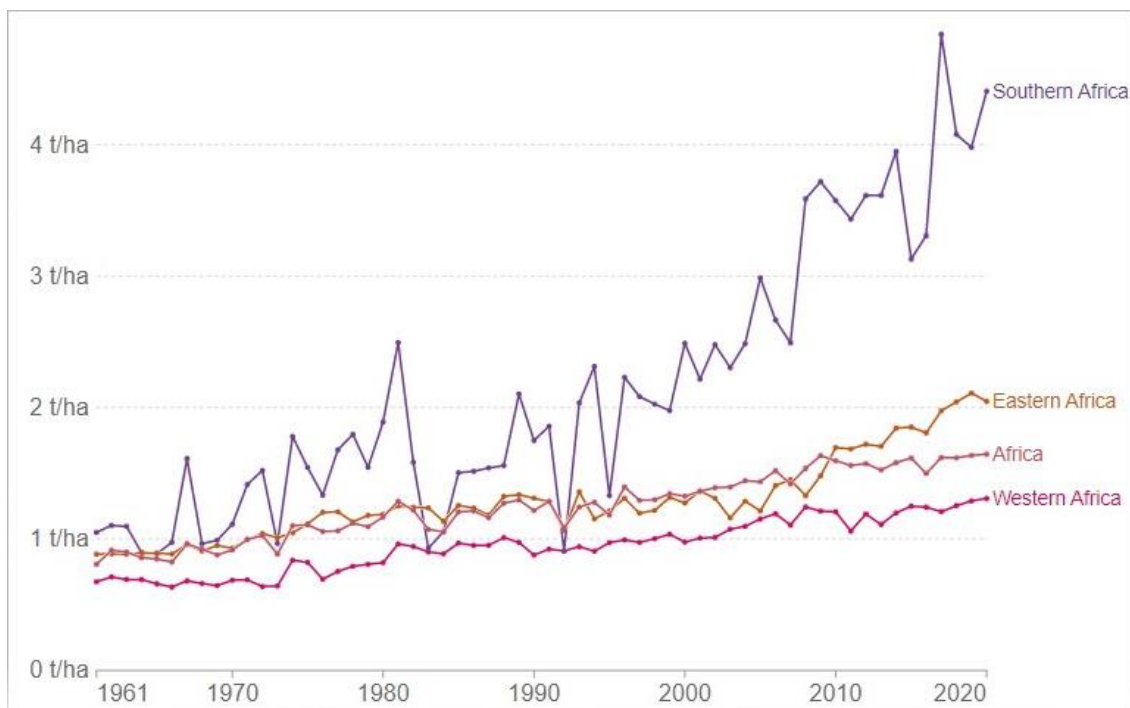


Figure 2.6: Cereal yield, 1961 to 2020 (FAO, 2021)

Note: Cereals include wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains.

2.5 CONCLUSION

This chapter provided the contextual background for the empirical papers presented in the subsequent chapters. The trends in remittance and other capital flows were presented and discussed and the stylised facts on remittances in sub-Saharan Africa highlighted. It also shows that remittances are relatively stable as compared to the volatility in other capital flows, and the general trend of remittance flow has been positive since 1990. The global remittance flow has shown resilience during a crisis than other global capital flows.

The chapter also discussed a brief overview of agricultural productivity in sub-Saharan Africa. It was found that agriculture contribution to GDP in sub-Saharan Africa is the highest, compared to the other regions. The variations in the share of agriculture's contribution to GDP revealed the diverse economic structure in sub-Saharan Africa. With the relative high contributions of agriculture to GDP ratio in sub-Saharan Africa,

improvements in agricultural productivity are critical for the transformation of African economies.

CHAPTER 3: REMITTANCES AND AGRICULTURAL PRODUCTIVITY: THE EFFECT OF HETEROGENEITY IN ECONOMIC ACTIVITY OF FARMING HOUSEHOLDS IN GHANA²

3.1 INTRODUCTION

Low agricultural productivity continues to be a problem in sub-Saharan Africa (SSA), and this phenomenon has gained the attention of policymakers and development practitioners over the past decades. In SSA countries where its population accounts for 60% of the global poor at the US\$2.15 poverty line in 2019, agricultural credit constraints are often seen as one of the key challenges facing farming households in adopting improved agricultural technologies to overcome food insecurity and poverty (Moser & Barret, 2006; Duflo et al., 2008; World Bank, 2022).

In Ghana, for example, where the agricultural sector contributes 19.26% of the GDP and employs at least 30% of the total labour force, over 40% of the population live in rural areas, mostly poor and on low incomes (World Bank, 2021).

Despite the importance of the agricultural sector to the overall economic growth in Ghana, agricultural productivity remains very low. Average yields of all crops are below their potential yields and are mostly less than 60% of the potential yields except sorghum and millet that have achieved 69% and 64% of potential yields respectively (MoFA, 2020).

Higher agricultural productivity will increase the sector's contribution to the economic growth of Ghana. The sector's low productivity can adversely affect the food security and increases vulnerability to expected poverty among farming households. Agricultural productivity can be increased by adopting modern agricultural technologies such as high-yielding seed varieties, fertilisers, and pesticides by farmers in SSA (Mukasa, 2018).

² This paper has benefited from comments and suggestions from participants at the 2023 meeting of World Finance Conference, Norway. August 2-4, 2023, at University of Agder.

However, the adoption rates for these modern agricultural technologies are low due to the lack of sufficient resources to purchase the inputs (Duflo et al., 2008), credit constraints (Moser & Barret, 2006), and insufficient knowledge about new agricultural technology (Krishnan & Patnam, 2014).

The New Economics of Labour Migration (NELM) hypothesised that remittances from migration are a strategy to reduce the financial liquidity constraints of rural households (Stark & Bloom, 1985). In this paper, we build on the literature by studying the effects of remittances on the agricultural productivity of farming households in SSA to examine if remittances relax liquidity constraints faced by farming households, particularly in Ghana.

Many studies suggest that remittances can be considered as a substitute for formal or informal credit that may enable households to overcome liquidity constraints and invest in new technologies and activities (Stark & Bloom, 1985; Wouterse, 2010; Amuedo-Dorantes & Pozo, 2011; Zahonogo, 2011; Maharjan et al., 2013). Remittance receiving agricultural households can increase their agricultural investments to increase their farm output (Chiodi, Jaimovich & Montes-Rojas, 2012; Huy & Nonneman, 2016). In addition, agricultural productivity can be improved through increased investment in modern farm machinery and technology (Kapri & Ghimire, 2020).

There is limited research on the impact of remittances on agricultural productivity (Ghimire & Kapri, 2020). The results from empirical literature, mainly from Latin America and Asia, on the impact of remittances on agricultural production and productivity is inconclusive; hence it cannot be generalised for SSA. For example, some studies found that remittances did not improve agricultural production (Harden, 1996; Jokisch, 2002; Tuladhar et al., 2014; Lim & Simmons, 2015) while other studies found positive impacts of remittances on the household's capacity to invest in agriculture and increase in production (Stark, 1980; Rozelle et al, 1999; De Hass, 2006).

Of the few studies that have studied remittances and agricultural productivity globally, only two countries studied are in sub-Saharan Africa (see Zahonogo, 2011; Akpan et al.,

2014; Dedewanou & Tossou, 2022). Akpan et al. (2014) studied the impact at the macro level of Nigeria without paying attention to the household level where migration and remittance decisions are taken. Zahonogo (2011), on the other hand performed household analysis but only used data from two villages in Burkina Faso which is not representative enough. The inconclusive findings indicate that the relationships between remittance and productivity are complex and may vary with specific local conditions (Akpan et al., 2014).

These findings may also be due to some heterogenous effects and conditions, like crop type, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities. For example, in countries and regions with heterogeneous agro-ecological zones, smallholder farmers may opt for more than one crop farming to allow for the spreading of risk from failure or low productivity from mono-crop farming and as a way to diversify income.

Similarly, some smallholder farmers also engage in non-farm enterprise activities to diversify activities, risk and income sources. Hence, although there could be a major crop, smallholder farmers typically have additional crops also serving to diversify income. For this reason, for a smallholder farmer who receives remittances, the utility of the remittance on farming may depend on whether the farmer has other crops or is involved in other non-farm enterprise activities. Specifically, remittances may induce a farmer to switch some labour effort away from the main farming crop to invest in other crops and/or non-farm enterprise activities, resulting in nonsignificant or, in extreme cases, reduced effect on the yield of the main crop.

The impact of remittances on the productivity of smallholder farmers can also be influenced by the initial investment (preparation and planting cost), gestation period (time to maturity) and the international market position-tradeable (major export crop or otherwise), the crop from the country also affects decision-making in the utility of remittances. Remittances could significantly reduce the investment cost for crops with a larger initial investment. This is also true for crops with longer gestation periods, e.g. tree crops and tradeable crops like cocoa or coffee in the case of Ghana, which also require

larger investment outlays for planting. Tradeable crops are also usually more productive because of the attraction of their international pricing and could induce increased attention to their cultivation by farmers who receive remittances.

Ghana poses an interesting case worth examining, because amongst the selected countries it is one which has had a plethora of agricultural and financial sector policies and strategies implemented since independence geared towards inducing financial interventions to modernise and bring about structural changes in Ghana's agricultural sector. Two five-year Development Plans, the first from 1951-1956 and the second from 1959-1964 emphasized the importance of agriculture to transform the economy. These plans also resulted in the formation of the United Ghana Farmers Co-operatives Council, Young Farmers League and the state farms. During these periods agricultural policies played key role in determining the performance of the Ghanaian economy.

The changing pattern of agricultural policies was reflected in the development of growth of the agricultural sector, which in turn heavily influenced the overall growth rate (Zimmermann et al, 2009). In the period of 1966–1984, overall growth fluctuations closely followed fluctuations in agricultural growth (Zimmermann et al., 2009). The poor performance of the economy led to structural adjustment policies which also affected agricultural reform. From 1991 to 2000 for instance the Ghana Medium Term Agricultural Development Programme (MTADP), was implemented to enhance market participation of agricultural products.

The Accelerated Agricultural Development Strategy (AAGDS), the Food and Agriculture Sector Development Policy I & II (FASDEP I & II), also focused on increasing agricultural productivity through improved access to technology and infrastructure, including small-scale irrigation projects. In all of these policies there was no explicit focus on finance apart from the earlier establishment of Agricultural Development Bank to provide credit facilities for the development and modernisation of agriculture. The recent Rural and Agricultural Finance Programme (RAFiP), and Planting for Food and Jobs (PFJ) therefore moved a step closer to focusing on financing.

According to the Global Findex database (2021), only about 7% persons borrowed from a formal financial institution in Ghana while about 39% borrowed from family or friends. The limited access to credit therefore poses a continuous threat to smallholder farmers in Ghana, leading to low agricultural productivity (Ayeh, 2011; Kuwornu et al., 2012). At the same time Ghana is the second largest recipient of remittances in sub-Saharan Africa. Remittance flow to Ghana in the last decade has increased from US\$ 135.85 million in 2010 to US\$ 4.29 billion in 2020 (World Bank, 2021). These inflows could have significant productivity effects on smallholder farmers.

The government of Ghana established Diaspora Affairs office at the office of the President in 2017 to harness remittances for productive investment. Despite the numerous policies and increasing remittances inflows, few studies have looked at the link between remittance inflows and smallholder farmers productivity especially so in the context of heterogenous farm activity in view of high credit constraint. This offers the opportunity to examine the link between remittances and smallholder farm productivity in Ghana.

In this paper, we test for the effect of remittances on the productivity of smallholder farmers in Ghana using the case for maize, cassava, and cocoa farmers. Maize and cassava form the largest staple food crops produced and consumed by the majority of smallholder farmers across agroecological zones in Ghana and play an important role in improving livelihoods of most rural dwellers (MoFA, 2021).

It is estimated that the average per capita consumption of maize and cassava are 76kg/annum and 570kg/annum respectively (MoFA, 2021). An improvement in maize and cassava productivity is therefore vital for achieving food security in Ghana. Cocoa on the other hand is the largest tree crop export earner for Ghana, generating US\$ 2.85 billion foreign exchange for the country in 2021 (GCB, 2022). The study uses crop yields as a proxy for agricultural productivity and defined as the ratio of output to farm area.

We distinguish our study from others by controlling for crop types (particularly tradeable or otherwise, and gestation period), farming of two or more crops, and engagement of smallholder farmers in non-farm economic activities. The study has important policy

implications in sub-Saharan Africa since the structure of the agricultural sector is similar across countries in the subregion with problems of low productivity and provides new empirical evidence on the impact of remittances on agricultural productivity in SSA.

The paper contributes to the literature by controlling for the heterogenous effects and conditions, like crop type, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities to explain the effect of remittances on agricultural productivity. The paper further disaggregates the effect on productivity based on the tradability of the crop: using maize, cassava (non-tradable) and cocoa (tradable) producing households.

We use the propensity score matching technique to address potential endogeneity issues from the estimation due to selection biases. Selection bias could arise due to reverse causality between agricultural productivity and remittances. Households with high agricultural productivity could have enough resources to send more family members abroad and, therefore, receive more remittances and vice versa. In employing the PSM technique to estimate the effects of remittances on productivity, the study controls for selection bias in the estimation process.

Our results initially show that remittances seem to reduce crop yield for both tradable and non-tradable crops. However, after controlling for the involvement of farmers in other economic activities apart from their main crop, we found that whilst yield continued to be negative for maize farmers who received remittances, cocoa farmers who received remittances did not significantly change. These results confirm that for farming households, remittances affect yield differently and depend on the crop type and the farmer's involvement in secondary economic activities.

The remaining part of the paper is organised as follows: Section 3.2 provides a brief overview of agricultural productivity in Ghana; Section 3.3 presents overview of migration and remittances in Ghana; Sections 3.4 and 3.5 present the literature review and the conceptual framework; methodology is presented in Section 3.6; and the results and conclusions of the paper are presented in sections 3.7 and 3.8, respectively.

3.2 BRIEF OVERVIEW OF AGRICULTURAL SECTOR PRODUCTIVITY IN GHANA

The agricultural sector plays a significant role in many developing countries' economic growth and development. The sector accounts for about 20% of Ghana's GDP and employs approximately 40% of the workforce.

Despite the important role that agriculture plays in the economies of SSA, including Ghana, the sector is plagued with several challenges that adversely impact the sector's productivity. The marginal productivity of labour and land remains low in the agricultural sector in Ghana (Aryeetey & Baah-Boateng, 2015; Owusu, 2016; MoFA, 2020). This low productivity is worsened by a poor land tenure system, lack of irrigation systems, land degradation and climate change.

Using cereal yield (ton per hectare) as a proxy for comparison of productivity across different regions of the world, Figure 4.1 shows that the cereal yield per hectare for Ghana and sub-Saharan Africa remained very low compared to the cereal yield per hectare for East Asia, the Pacific, and European Union countries. The yield gap of sub-Saharan Africa was two times less than the European Union in 1961. However, by the end of 2018, the yield gap increased to over five times the cereal yield per hectare for the European Union, reaching 5.2 t/ha, while sub-Saharan Africa still lagged with 1.4 t/ha. The cereal yields for Ghana were similarly low. With farmers in sub-Saharan Africa producing only 1.4 tonnes of cereal per hectare while farmers in Europe and East Asia produce more than 5 tonnes of cereal per hectare, there is a need for farmers in Africa to learn from the experiences of Asian and European farmers who were producing grains at 1.5 tonnes per hectare in the 1960s. During the Green Revolution, Asian farmers adopted agricultural technology in their production methods and doubled their productivity within two decades (1960 to 1980).

Access to improved agricultural inputs and markets is necessary to transform the agricultural sector from low productivity into a highly productive sector. Farmers in sub-Saharan Africa are still grappling with access to improved inputs and, at the same time, limited market access to generate the required returns to invest in the sector.

The Food and Agriculture Sector Development Policy (FASDEP I) was developed in 2002 as a policy of the Ghanaian government to guide development and investments in the agricultural sector. In 2007, FASDEP II was approved as the revised agricultural policy for Ghana. The policy focuses on modernising agriculture in which productivity and production improvements are increased through applying science and technology throughout the commodity value chain.

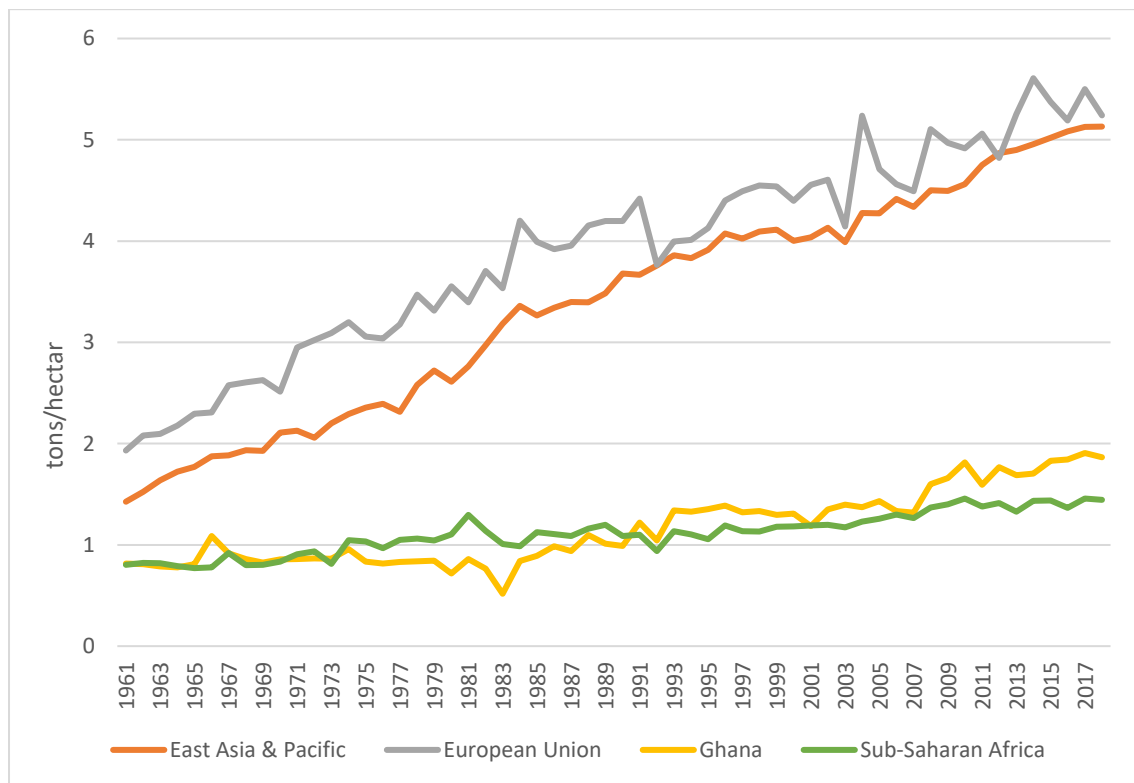


Figure 3. 1: Cereal yield (ton per hectare)

Source: World Bank Development Indicators

To improve the development and growth of agriculture in SSA, the African Union launched the Comprehensive Africa Agriculture Development Programme (CAADP) in 2003 to serve as a framework for action for agricultural transformation in support of individual country-level efforts across Africa. This has led to respective countries developing their National Agricultural Plans to address the challenges of agriculture, key among them is raising agriculture productivity.

African governments have committed to allocating at least 10% of their national budgets to agricultural investment. All these efforts aim to increase agricultural productivity through increased investment in agricultural research to help feed the African population. Despite Ghana having signed up for the CAADP commitment to spend at least 10% of its national budget on agriculture, Ghana's agricultural budget share has remained below the 10% commitment. The channel of remittance resources to agricultural investment could be a way to bridge the financing gap in the agricultural sector.

Due to the location of Ghana across different agro-ecological zones, the agricultural sector in Ghana is also characterised by multiple crops suitable for cultivation in the various zones, some with longer gestation and others with short gestation.

For instance, cereals are mostly ideal in deciduous forest and savannah zones, while commercial tree crops such as cocoa and oil palm are suitable in rainforest zones. The different agro-ecological zones vary with the amount and distribution of rainfall. Agricultural production in Ghana is largely dependent on rainfed agriculture. With variations in rainfall across the agro-ecological zones, production systems under rainfed will also have variations in the productivity of crops across the agro-ecological zones.

Crops under cultivation in Ghana vary from food crops to export crops. Most export crops like cocoa and oil palm are tree crops with longer gestation, while food crops like cassava and maize are mostly roots/tubers and cereals with a short gestation period. These crop differences also appear in the productivity pattern across the agroecological zones, making achieving higher productivity across the agricultural sector a more complex feat.

Table 3.1: Agriculture subsector GDP growth rates at 2013 constant prices (%)

Subsector	2013	2014	2015	2016	2017	2018	2019	2020
Crops	5.9	2.8	1.7	2.2	7.2	5.8	5.3	8.7
Cocoa	2.6	4.3	-8	-7	9.2	3.7	5.4	1.9
Livestock	5.3	5.1	5.2	5.4	5.7	5.4	5.4	5.4
Forestry& logging	4.6	-1.5	-3.9	2.9	3.4	2.4	-1.7	-9.2
Fisheries	5.7	-23.3	8.5	3.1	-1.4	-6.8	1.7	14.4
Agriculture	5.7	0.9	2.1	2.7	6.2	4.9	4.7	7.4

Source: Ministry of Food and Agriculture, Statistical, Research and Information Department (MoFA, SRID) (2021)

Within the CAADP framework, African countries are also committed to achieving at least a 6% annual agricultural growth. The average annual growth of the agricultural subsectors and agriculture in Ghana is presented in Table 3.1 which shows that the annual agriculture growth has been less than the targeted 6%, except in 2017 and 2020. The 6.2% growth in 2017 was largely driven by the cocoa and crop subsectors, achieving more than 6% growth. The 7.4% growth in 2020 was driven by the fisheries and crop subsectors.

The average yield of main crops produced in Ghana is presented in Table 3.2. The average yields are compared with potential yields under rain-fed conditions and demonstrates that all crops have average yields below the potential yields. The potential yields are the yields that can be achieved under effective extension and application of recommended agronomic practices. The most productive crop was sorghum, followed by millet and cocoa. These three crops had average yields above 50% of the respective potential yields. The average yields of the remaining crops were below 50% of the potential yields.

The population of Africa is projected to reach 2.46 billion by 2050 (UN DESA, 2022). With the increasing population, increasing agriculture productivity through adopting improved agricultural technologies is necessary to guarantee food security and nutrition for the growing population. OECD-FAO (2016) projected that to meet food demand, sub-Saharan agricultural productivity will have to double what it produced in 2012. This will require enormous financial resources for investment in the agricultural sector, and remittance is a potential financial flow source to support the sector's investment.

However, the heterogeneous nature of the agricultural sector and its investment requirements can also impact the effect of interventions on productivity.

Table 3.2: Average yield of selected crops under rain-fed conditions (2019)

Crop	Average Yield (Mt/Ha)	Potential Yield (Mt/Ha) *	% Achieved
Cassava	21.33	45.00	47.40%
Plantain	12.11	38.00	31.87%
Yam	16.58	52.00	31.88%
Cocoyam	7.19	20.00	35.95%
Maize	2.26	5.50	41.09%
Rice (paddy)	2.96	6.00	49.33%
Millet	1.28	2.00	64.00%
Sorghum	1.39	2.00	69.50%
Cocoa	0.54	1.00	54.00%
Cashew	0.44	1.80	24.44%
Tomato	7.93	20.00	39.65%
Pepper	8.88	30.00	29.60%

Source: Ministry of Food and Agriculture, Statistical, Research and Information Department (MoFA, SRID) (2020)

**Potential yields refer to yields that have been achieved in cases where more effective extension and use of recommended technologies have occurred.*

3.3 OVERVIEW OF MIGRATION, MAJOR DESTINATIONS, AND REMITTANCE INFLOWS IN GHANA

Migration in Ghana in the early 20th century was mainly in the form of rural-to-rural migration, with the migrants working on cocoa farms and gold mines on seasonal or semi-permanent basis (Knight, 1972; Brydon, 1992). During the pre-colonial times up to the late 1960s, international movement from Ghana involved a relatively small number of people, mainly students and professionals, to English speaking countries due to colonial links (Anarfi et al. 2000).

Ghana started to experience an economic crisis from 1965 which led to the beginning of many Ghanaians travelling outside in search of jobs. Most of these emigrants were

professionals such as teachers, lawyers, and administrators, some of whom were invited by countries such as Uganda, Botswana, Nigeria and Zambia to assist with their national development after independence (Anarfi et al. 2000).

The beginning of the 1980s also ushered a large scale of Ghanaians traveling abroad. This phase of migration included unskilled and semi-skilled persons in search of jobs in neighbouring West African countries such as Cote d'Ivoire and Nigeria (Anarfi, 1982). For instance, as of December 1980, about 150,000 Ghanaians had registered with the Ghana High Commission in Lagos, Nigeria (Anarfi, 1982). In 1986, the number of Ghanaians in Côte d'Ivoire was estimated to be between 500,000 and 800,000 (Anarfi et al. 2000).

The migration of Ghanaians to neighbouring countries continued through the 1990s. Initially, Nigeria became a major point of destination for Ghanaians. But with the expulsions of Ghanaians from Nigeria in 1983 and 1985, the destination countries of Ghanaian migrants became more diverse, particularly for professionals (Anarfi et al. 2003). Due to the strong value of the Nigerian Naira at the time, some professionals took advantage to travel to Europe, America and other African countries while the semi-skilled workers tried to go wherever they could (Anarfi et al. 2003). Since the 1990s, large numbers of Ghanaians have moved to major cities such as London, Amsterdam, Hamburg and New York (Black et al. 2003).

The 2021 population and housing census (PHC) report of Ghana shows that of a total of 30,832,019 people enumerated, 71.1% were non-migrants and the remaining 28.9% were migrants. The proportion of migrants in the population is much higher in the rural areas (33.9%) than urban areas (22.2%). Majority of the migrants (52.5%) were females compared with 47.5% who were males. A total number of 293,416 Ghanaians were reported to be living outside the country in the PHC report.

Table 3.3 shows that the main destinations for Ghanaian emigrants were Europe (37.6%), the Americas (23.7%) and Africa (33.3%). Among the Ghanaian emigrants to African countries, 23.3% travelled to ECOWAS countries and the remaining 10% travelled to

other African countries. Within West Africa, Côte d'Ivoire has most of Ghanaian emigrants, serving as a destination for 7.3 percent followed by Nigeria (6.0%).

The 2021 population and housing census reports that employment, settlement, marriage and education are the main reasons behind both internal and international migration among Ghanaians. As evidenced from Table 3.4, these four factors account for 97% of internal and 99.7% of international emigration. The main factor behind the migration of Ghanaians is to seek economic opportunities, 24.5% (internal migration) and 73.4% (international emigration) while the number who migrate as a result of socio-political displacement or natural disaster is very small.

Table 3.3: Major destination of Ghanaian emigrants (Source: Ghana Statistical Service, 2023)

Destination	Number	Percent
Burkina Faso	2,805	1.0
Cote d'Ivoire	21,526	7.3
Gambia	4,115	1.4
Liberia	4,130	1.4
Nigeria	17,607	6.0
Sierra Leone	1,593	0.5
Togo	8,525	2.9
Other ECOWAS countries	8,210	2.8
Africa, other than ECOWAS	29,310	10
Americas (north, South/Caribbean)	69,600	23.7
Asia	13,684	4.7
Europe	110,239	37.6
Oceania	2,051	0.7
Other (unknown)	21	0.0
Total	293,416	100

Table 3.4: Reasons for migration (Source: Ghana Statistical Service, 2023)

Reasons for migrating	Internal migrants (%)	International emigrants (%)
Employment	24.5	73.4
Settlement/ relocation	35.9	2.1
Marriage/ family reunion	24.9	9.6
Education/ training	11.7	14.6
Socio-political (asylum seekers)	0.1	0.0
Natural disaster	0.1	0.0
Health	1.0	0.1
Other	1.9	0.3
Total	100	100

One of the outcomes of migration is remittances sent back to the remaining household. Ghana is the second largest recipient of remittances in sub-Saharan Africa as indicated in Chapter 2. The annual remittance flow to Ghana is presented in Figure 3. 2.

In the last decade, remittance flow to Ghana has increased from US\$ 135.85 million in 2010 to US\$ 4.29 billion in 2020 (World Bank, 2021). The trend in Figure 3.1 is deflated with US consumer price index so that the remittances flow will be in real term, and that will allow comparison over time. The changes in real exchange rate of USD can affect remittance flow. As shown in Figure 3. 2, the highest amount of real remittance flow to Ghana was recorded in 2015 (US\$ 5.6 billion). Remittances inflows to Ghana in 2010 and 2014 recorded sharp increases. The Bank of Ghana explains that such increases resulted from improved data collection tools on remittances for those years (IOM, 2020).

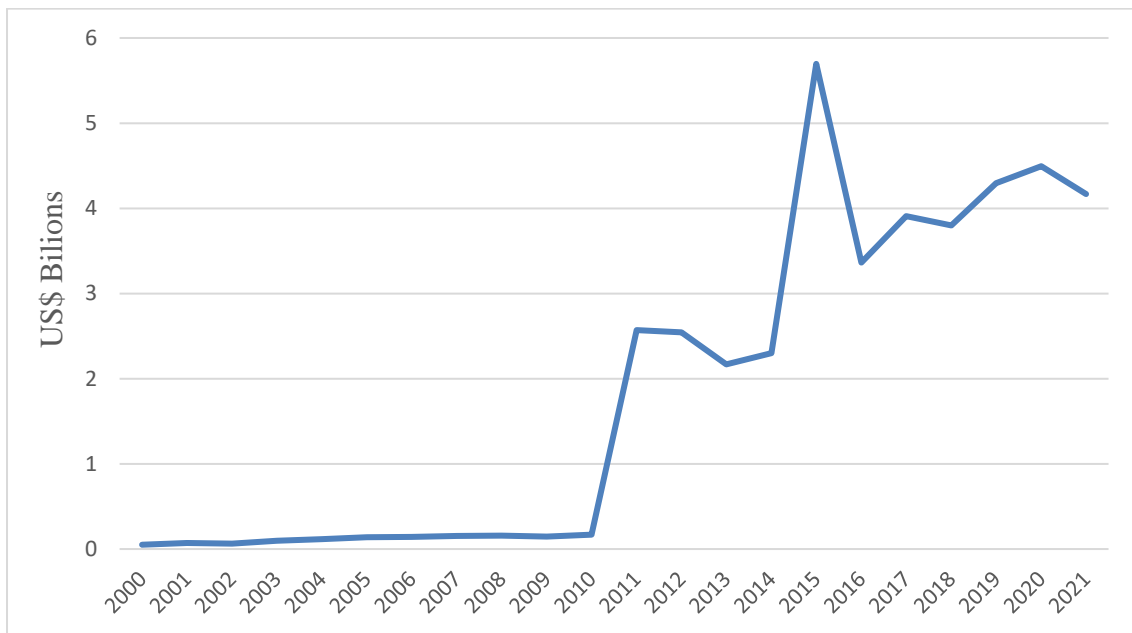


Figure 3. 2: Annual remittance inflows to Ghana (deflated with US CPI)

Source: World Bank Annual Remittances Data (updated as of May 2022)

3.4 LITERATURE REVIEW

This section briefly reviews literature on remittances and agricultural productivity in sub-Saharan Africa and other parts of the world. Selected empirical studies on remittances and agricultural productivity are also discussed.

3.4.1 Theoretical literature

This subsection reviews theories that help to explain the transmission mechanism from remittances to agriculture productivity.

Agricultural household models are designed to capture the effects of agricultural policies in a complex behavioral interactions characteristic of semi-commercialized and rural economies (Singh et al., 1986). Agricultural household models seek to determine the transmission of government policies on agricultural activities that affects production decisions of households. Households purchase agricultural inputs such as fertilisers, improved seeds, labor, etc. from households' own resources. Therefore, any policy that affects household's income, affects not only production but also consumption and labor supply (Singh et al., 1986).

The existence of Agricultural household models enables researchers to examine consequence of policy in three dimensions: well-being of agricultural households; sectoral spillover effects; and macroeconomic performance of the agricultural sector. The importance of the agricultural households in the economy and resulting consequences of agricultural policies therefore requires a thorough theoretical and empirical research.

The Neo-classical migration theories explain the relationship associated with migration and distribution of factors of production. It assesses the impacts of distribution of labor from rural economies to urban economies or from agriculture to other sectors within an economy. The Neo-classical migration theories respond to the disequilibrium of the supply and demand of labor. Examples of the Neo-classical migration theories include surplus of labor theory (Lewis, 1954), “push-pull” model (Lee, 1966) and migration model (Todaro, 1969). At the macro level, the neo-classical theory uses the geographical differences between the supply and demand for labor to explain migration (De Haas, 2010). The neo-classical theory assumes labor to move from low wage geographical areas to high wage geographical areas. As labor moves, capital is expected to move in the opposite direction through remittances.

The New Economics of Labor Migration (NELM) (Stark and Bloom, 1985) views migration as a permanent source of livelihood strategy to diversify household income sources through remittances to be able to overcome risks and credit constraints (Kinuthia, 2020). Taylor (1999) argues using NELM to state that the migration decisions are part of family strategies to raise income for investments and to provide insurance against income and production risks; and to overcome production and investment constraints faced by the households. The provision of resources for investment in agricultural sector could lead to increase in the use of more productive agricultural inputs that can increase productivity of farms.

3.4.2 Empirical Literature

The existing literature on remittances analyses its household impacts on household outcomes such as assets (Chiodi et al., 2012), education and health (Clément, 2011),

income smoothing (Amuedo-Dorantes & Pozo, 2011), and agriculture production (Zahonogo, 2011; Akudugu, 2016).

The empirical findings on the impact of remittances on agriculture production and productivity are mixed across geographic areas and time. Kapri and Ghimire (2020) indicate that in theory, the impact of remittances on the agriculture sector can be positive or negative: when labor reduces due to migration, agricultural output will be affected negatively but when remittances increase household capital for investment in agricultural inputs, productivity will increase.

The majority of the available empirical studies are conducted in Asia and Latin America with very few studies from Africa. The non-convergence of conclusion of studies across different regions on the relationship between remittances and agricultural production implies that the impact of remittance on agriculture production or productivity is context dependent and not geographic specific.

The results from empirical studies can be grouped into three categories: (1) remittances negatively affect agricultural production; (2) remittances have no significant impact on agricultural production; and (3) remittances have positive effects on agricultural production.

Among the studies that showed no significant effects of remittances on agriculture productivity, Maharjan et al. (2013) studied agricultural production and remittances in Nepal, the study assessed the impact of remittances on agricultural productivity. The study found that although remittances improved the liquidity constraints of farming households, it had no significant effect on agricultural investments. It further concluded that the migration of a family member resulted in a reduced number of family labour available for farm work. The study by Tuladhar et al. (2014) came to a similar conclusion as Maharjan et al. (2013) that remittances did not have a significant effect on agricultural output, pointing out that the remittances were spent on consumer goods.

At the macro level, some studies have tried to test the relationship between remittances and productivity through growth, e.g. Ustarz and Issahaku (2017) sought to test the relationship between remittances and total factor productivity in Ghana and concluded that remittances had a negative effect on economic growth in Ghana. In addition, the net effect of outward migration outweighed the benefits of remittances. Akudugu (2016), examining the relationships between agricultural productivity, access to credit and farm size in Ghana, found that the amount of remittance received by farm households has negative and insignificant influence on agricultural productivity.

Barham and Boucher (1998) stressed that households that benefit from remittances from migrants tend to participate less in the labour market. This is because such households enjoy a large flow of remittances enough to provide for the entire household. There is also a school of thought that most remittances that are received by households are used mainly for consumption purposes rather than invested in activities such as business growth (Chami et al., 2003). This school of thought was disputed though by Adams (2006), who stressed, using the example of Guatemala, that most remittances received by Guatemalan households were invested rather than put into consumption.

Huy and Nonneman (2016) studied the relationship between migration, remittance and agricultural output in Vietnam using Cobb-Douglas production function and found a positive relationship between remittances and agricultural output of recipient households. A similar study was conducted by Rozelle et al. (1999) and Kapri and Ghimire (2020) using 3-SLS and found a positive relationship between remittance and agricultural productivity, specifically that remittances loosen constraints on crop production and stimulate productivity (Rozelle et al, 1999).

The existing literature reviewed have mixed findings. The existing literature account for the effects of farm level characteristics in the analysis. The mixed findings may be due to some heterogeneous effects and conditions, like crop type, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities.

Table 3. 5: Summary of Empirical studies on impact of remittances on agriculture

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
Rozelle et al. (1999)	China	Iterative three-stage least squares (3SLS).	Dependent: <i>yield</i> Explanatory: <i>number of migrants, total remittances, experience of household head, Education of household head, household size, young dependents, land per capita, value of non-productive assets, village, and plot characteristics</i>	Access to capital through increased remittances has a positive effect on yield.
Zahonogo (2011)	Burkina Faso	Iterative three-stage least squares (3SLS).	Dependent: <i>Total crop production</i> Explanatory: <i>Number of migrants, Remittance income, Agricultural income, Non-agricultural income, Working force, Animal traction, Education of household head, Age of household head.</i>	Remittances had no significant effect on agricultural production.
Akpan et al. (2014)	Nigeria	Error correction model (ECM).	Dependent: <i>Remittances</i> Explanatory: <i>agricultural GDP/total GDP, Agricultural productivity index and crop productivity index</i>	There was no significant relationship among growth rates of remittances, agricultural GDP,

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
				agricultural productivity index and crop productivity index in Nigeria.
Maharjan et al. (2013)	Nepal	Instrumental Variable (IV) two-stage least squares (2SLS).	Dependent: <i>Total crop production</i> Explanatory: <i>Number of migrants in household, Age of household head, Caste of household, Number of economically active males (15–60 years old), Number of economically active females (15–60 years old), Number of very young dependents (< 6 years old), Number of adults with higher education, Log of total agricultural land holding, Total livestock holding, Household indebtedness, Family migration network</i>	Remittances had no significant effect on agricultural investments.
Tuladhar et al. (2014)	Nepal	Iterative three-stage least squares (3SLS).	Dependent: <i>Yield</i> Explanatory: <i>Temporary migrants, Remittance received, Household size, Proportion of year-round irrigated land, Number of livestock, Use of</i>	Remittances did not have a significant effect on agricultural output.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>chemical fertilizer, Sex of household head, Age of household head, Education of household head, Annual consumption expenditure, Number of children.</i>	
Akudugu (2016)	Ghana	Instrumental Variable (IV) two-stage least squares (2SLS).	Dependent: <i>ratio of farm revenue to cost of farm production.</i> Explanatory: <i>formal credit, informal credit, dependency, remittances, farm size, market access.</i>	The amount of remittance received by farm households has a negative but insignificant influence on agricultural productivity.
Huy and Nonneman (2016)	Vietnam	Cobb-Douglas production function and Instrumental Variable (IV).	Dependent: <i>Agricultural income</i> Explanatory: <i>Age of household head, Household size, Income, Urban area, number of migrants, remittances.</i>	A positive relationship between remittances and agricultural output of recipient households.
Ustarz and Issahaku (2017)	Ghana	Stepwise regression and Quantile regression.	Dependent: <i>total factor productivity</i> Explanatory: <i>remittances as a ratio of GDP, net foreign direct investment as a percentage of GDP, foreign aid as a</i>	Remittances had a negative effect on economic growth in Ghana.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>percentage of GDP, economic openness, and Inflation.</i>	
Kapri and Ghimire (2020)	Nepal	Iterative three-stage least squares	Dependent: <i>Value of crop production per labor hours</i> Explanatory: <i>remittance inflows, number of migrants, household size, rural/urban, share of children age 15 under, Share of female age 16–64, Share of elders age 64 above, Irrigation dummy, land per person, Invest per person.</i>	A positive relationship between remittance and agricultural productivity.
Dedewanou and Tossou (2022)	Burkina Faso	Bayesian instrumental variables model	Dependent: <i>Total crop production</i> Explanatory: <i>remittances, cultivated area, labor, quantity of herbicide, quantity of fertilizer.</i>	A negative relationship between remittance and agricultural productivity.

3.5 CONCEPTUAL FRAMEWORK

Remittance flows to countries can impact agricultural investment and household consumption. Within the context of this study, the paper seeks to explore how remittances can impact agricultural development by assessing the relationship between remittances and agricultural productivity.

Multiple frameworks predict the impact of remittance on agricultural productivity (Kapri & Ghimire, 2020). To fully understand the relationship between remittances and agricultural productivity, it is important to establish the motivations for the remittance. When households receive remittances from family and friends, these remittances could be used to invest in agricultural activity or spent on general household expenditure.

If the households decide to invest the remittances received (endogenous approach), or the remittance is meant for investment (portfolio approach), agricultural investment is an option. The endogenous approach is based on the remittance recipient family's decision making, which is not necessarily limited to the altruism motive for remittance while the portfolio approach is a more personal decision of the migrant to remit in the form of financial or real assets for returns (Elbadawi et al., 1992). The money received through remittances could be used to purchase agricultural inputs or to offset some financial challenges the agricultural household faces. The inputs can be assets (machinery) or production materials.

The paper further relies on the concept that remittances provide a substitution for rural credit markets. The underlying theory of this framework is based on the New Economics of Labour Migration (NELM) theory (Stark & Bloom, 1985). The NELM explains that remittances from migrants help receiving households overcome the liquidity constraints facing them. Therefore, the paper will empirically assess how households use remittances to overcome credit constraints they face.

The assumption here is that when households with migrants need credit, they can easily rely on remittances from family members elsewhere to finance the activity that credit would have financed. If the smallholder farmer decides to use remittance received for

agricultural investment, the impact of remittances on the farm productivity could differ according to the farming system under cultivation (mono-cropping or mixed cropping) and their engagement in other non-farm economic enterprises. Receiving remittances can induce a farmer to switch from the main crop production and invest in other crops and/or non-farming activities. Given the defined amount of resources, if the farmer decides to invest in other crops or non-farming activities, the effect of the remittance receipt on the main crop may not be significant or, in extreme cases, reduce the yield.

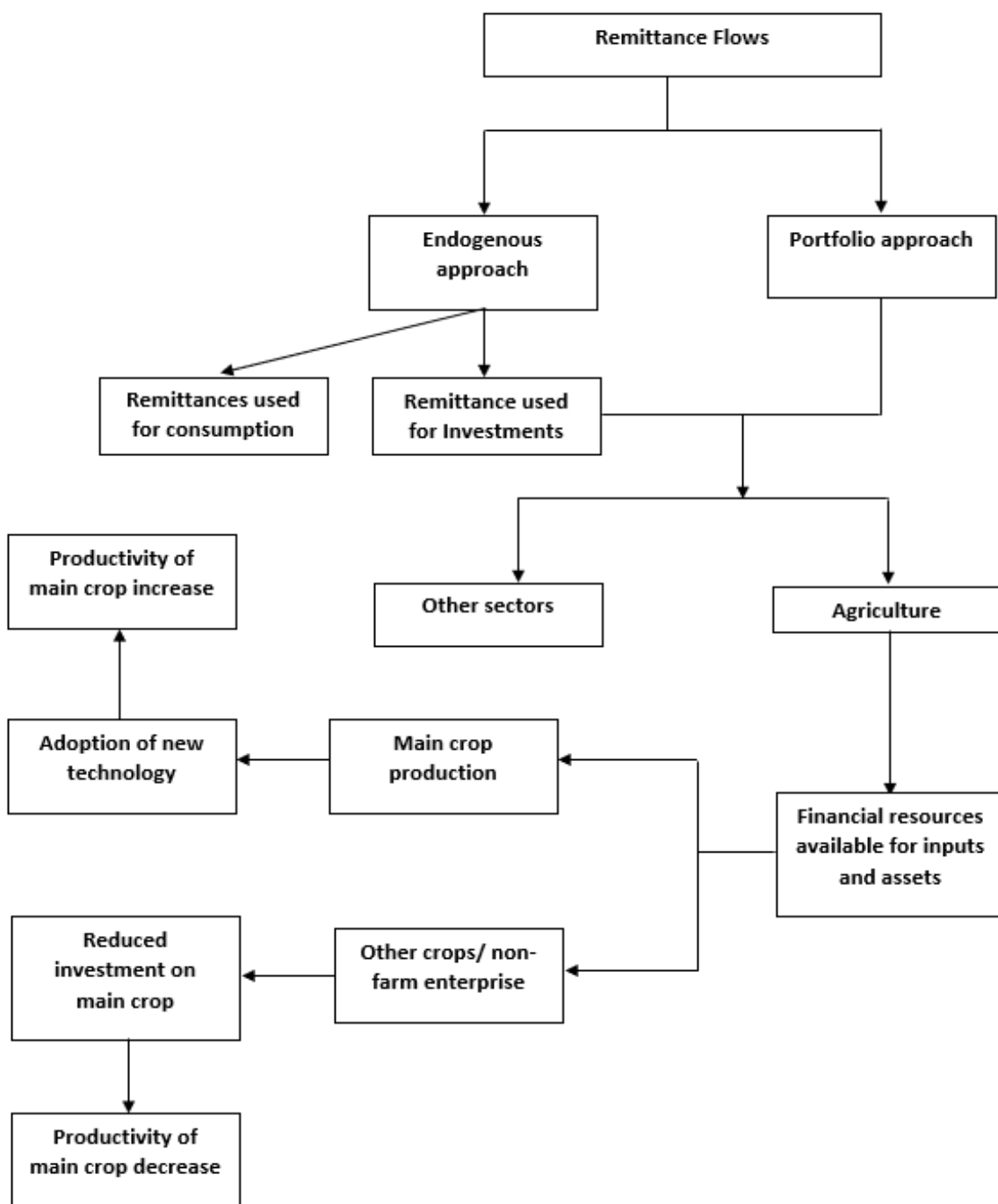


Figure 3. 3: Conceptual Framework

3.6 METHODOLOGY

3.6.1 The estimation techniques

The receipt of remittances by households is not randomised and therefore the problem of possible selection bias could arise in the estimation process if not properly controlled.

Selection bias could arise due to reverse causality between agricultural productivity and remittances. Households with high agricultural productivity can have enough resources to send more members abroad and therefore receive more remittances and vice-versa. Given the difficulties associated with estimating parameters with selection biases (see Clément, 2011), this study proposes to use the propensity score matching (PSM) approach developed by Rosenbaum and Rubin (1983) to control for a potential selection bias to produce consistent estimates where PSM is “the conditional probability of assignment to a particular treatment given a vector of observed covariates” (Rosenbaum & Rubin, 1983). The PSM quantifies the average effect related to the receipt of remittances by matching remittance receiving households (treatment group) with households with similar characteristics that do not receive remittances (control group) (Clément, 2011).

PSM was chosen as the most suitable evaluation technique for the estimation of the treatment effect of access to remittances on agricultural productivity because the receipt of remittances by the households in the sample were not randomised. Glennerster and Takavarasha (2013) notes that PSM is one of the impact evaluation methods that provide effective estimation of a causal effect in the absence of randomisation evaluation. According to Gertler et al. (2011), if a group did not participate in a project, but a counterfactual can be identified for comparison, PSM can be applied. Using PSM helps to reduce selection bias linked to observed differences in the socioeconomic characteristics between remittance recipients and nonrecipient households (Clément, 2011).

The PSM involves two stages. The first stage involves estimating the predicted values of the probability of receiving remittances by using the probit regression model. The equation for the predicted values or propensity score is presented as:

$$P(X_i) = P_r(R_i = 1|X_i) \quad (3.1)$$

where $P(X_i)$ is the propensity score, that is the predicted value of receiving treatment, R is the treatment (remittances), X_i is the set of observed household and farm level characteristics such as age, sex, years of education, household size, farm size, use of agricultural inputs, access to credit and access to extension services.

The second stage matches household receiving remittances with non-recipients based on their propensity score. The estimation of PSM requires three assumptions to be made. The first assumption for PSM estimation is the conditional independence assumption which states that the expected outcome in the untreated state (Y_i) is independent of treatment participation and is conditional upon a particular set of observed characteristics (X) (Rosenbaum & Rubin, 1983). This means that any exogenous variable that affects the treatment cannot impact the outcome and vice versa. This assumption can be expressed as:

$$(Y_{i0}, Y_{i1}) \perp R_i | X_i \quad (3.2)$$

The second assumption is referred to as the overlap or common support condition. This condition requires the unit of analysis should be a common region based on the propensity score. For the purpose of matching, the treatment group (households receiving remittances) and the control group (households without remittances) must not overlap, and the conditional probability of each household receiving treatment must be positive within 0 and 1. This assumption is expressed as:

$$0 < P_r(R_i = 1 | X_i) < 1 \quad (3.3)$$

The third assumption is the balancing of the covariates. Each household within the treated group (receiving remittance) and control group (without remittance) must have its covariates balanced based on the propensity scores. This means that the treatment and control groups must have the same or similar distribution, given the row of covariates. Therefore given X_i , the outcomes of the control units can be used to estimate the counterfactual outcome of treated units in the absence of treatment. This is expressed as:

$$\{P_r[X_i | R_i = 1, P(X_i)] = P_r[X_i | R_i = 0, P(X_i)]\} \quad (3.4)$$

The effect of remittance on productivity, the average treatment effect on the treated (ATET) is calculated as the difference between the average outcome of the treatment group and the average outcome of the control group in the treated population. This is expressed as:

$$ATET_{psm} = E[Y_i|R_i = 1, P(X_i)] - E[Y_i|R_i = 0, P(X_i)] \quad (3.5)$$

3.6.2 The data and variables

This study uses the seventh round of the Ghana Living Standard Survey dataset. It is the latest household survey and is publicly available on the website of the Ghana Statistical Service and is the most representative of national household surveys available for this study in Ghana. It is a multi-purpose survey of, collecting information on different dimensions of agriculture and household socioeconomic characteristics in Ghana. The Ghana Living Standard Survey has data on agriculture, socioeconomics and other variables. The data on agricultural production, use of inputs, and household demographic characteristics are useful in estimating the agricultural productivity of households.

The study defines agricultural productivity as the production volume per farm area (yield). Due to difficulty in converting non-standard units of harvest (beer bottle, Fanta bottle, packet, box, single, etc.) to standard units such as metric tonne or kilograms, observations with such non-standard units of harvest for which conversion was not possible either due to lack of conversion scale or possible data entry errors, were dropped from the analysis. The sample size for the survey was 14 009 households and conducted in 2017. The study used a two-stage stratified sampling procedure for the survey.

In the first stage, enumeration areas were selected to form the primary sampling units from the ten regions of Ghana using probability proportional to the population size of each region.

In the second stage, households were systematically selected from the primary sampling units. From the sample data, about 4 954 households cultivated and harvested maize within the reference period for the GLSS 7-round survey and 1 394 households cultivated and harvested cassava. Among the cash crops (tradeable and longer gestation crops),

about 1 224 households cultivated and harvested cocoa. Additionally, these crops were selected based on their economic importance to Ghanaian farmers.

3.6.3 Description of variables

The explanatory variables are included in the estimation of both the selection model (factors influencing receipt of remittance) and the outcome model are presented in Table 3.6.

Thapa (2008) and Ali et al. (2016) cited the contribution of gender to agricultural development. There is evidence of a productivity gap between male and female farmers due to limited access to farm inputs and socio-cultural household chores that affect women's productivity compared to their male counterparts. As a result, female-managed farms are likely to be less productive than male-owned farms.

The amount of remittances sent home can be influenced by the gender of the remitter. Buvinic and Gupta (1997) explained that female heads typically work for lower wages and have less access to productive assets than men due to gender bias against women. Again, women typically bore the burden of household chores, which results in time and mobility constraints (Buvinic & Gupta, 1997), hence men tend to migrate more than women.

Given that men migrate more than women, it is expected that men will remit more than women. If the female is the head of the recipient household because the male has migrated, then it is expected that female headed households will receive more remittance than male headed households.

Years of formal education and human capital development are significant in increasing agricultural productivity (Nordjo & Adjasi, 2019). The high knowledge and skills gained from formal schooling enable the farmer to apply farm inputs in the right proportions and adopt modern technologies (Huffman & Orazem, 2007; Weir, 1999).

The educated members of the household are assumed to have more knowledge about job opportunities abroad and are, therefore, able to make migration decisions in search for economic opportunities. It is expected that the higher the number of years of formal

education, the higher the amount of non-farm income, leading to higher household income. Educational attainments increase human capital and therefore, with higher incomes, can send family members abroad (Lucas & Stark, 1985; Adebayo et al., 2021).

The New Economics of Labour Migration (NELM) hypothesis suggests that adult household members participate in the decision-making process concerning migration-related activities of the household.

The endogenous migration approach implies that migration is based on the family decision. The age of the household head is used to represent the experience of the household head. This variable is assumed to have a significant role in the decision of household expenditure pattern. Therefore, older household heads are expected to be able to send a child abroad rather than a younger household head who has less experience.

Ravallion and Dearden (1988) observed that there is positive relationship between age of household head and remittance receipts among rural households, thus remittances target the elderly. Similarly, Mannan and Farhana (2014) found a positive relationship between age of household head and remittances received. They explain that the adult children care for their elderly parents as well their grandparents.

Theoretically, there is a positive relationship between credit and agricultural productivity (Akudugu, 2016). Access to credit enables farmers to finance the cost associated with agricultural production. Many studies suggest that remittances can be considered as a substitute for credit that may enable households to overcome liquidity constraints and invest in new agricultural technologies such as fertilisers, improved seeds, insecticides and irrigation (Stark & Bloom, 1985; Wouterse, 2010; Amuedo-Dorantes & Pozo, 2011; Zahonogo, 2011; Maharjan et.al., 2013).

Farmers can invest in productive inputs and technologies that enhance their productivity when they have access to remittance. An increase in agricultural productivity requires an efficient mix of agricultural inputs (Beets, 1990). For example, the use of fertilisers will increase the nutrition for the crops, thereby increasing productivity. Similarly, their productivity is expected to be higher for farming households that use irrigation systems than non-irrigated farms.

The effect of farm size on productivity has mixed results in the literature. Some studies have established an inverse relationship between farm size and productivity (see Barret, 1996; Akudugu, 2016). Other studies found a positive relationship between farm size and productivity (for example, Akudugu, 2011). Akudugu (2016) established a non-linear relationship between farm size and productivity, which means that farm size positively affects productivity beyond a certain threshold size. The non-linear relationship is significant in explaining the relationship between farm size and productivity.

The relationship between the size of farm and remittance could be positive or negative. The reduced labor on farm due to migration could impact size of farm negatively but the increase in capital investment and the improvement in technology fueled by remittances could increase farm size (Kapri & Ghimire, 2020). Lucas (1987) finds that in South Africa, temporary labor migration diminishes labor resource areas' crop production in the short run, but enhances crop productivity through invested remittances in the long run. The extent to which remittances can affect farm size depends on the net effect between loss of labour and the amount of remittances to pay for hired labour.

Zahonogo (2011) notes that the average size of the household is higher for the households with migrants than households without migrants. He explains that larger household size has more probability of having more migrants than smaller households. It is expected that large households with more migrants will receive more remittance than households with fewer migrants.

Table 3.6: Variable description

Variable	Variable description
Remittances	Receipt of any type of remittance. Dummy variable, remittance recipient =1, otherwise =0
Sex	Biological sex of the household head. Dummy variable, Male =1, otherwise =0
Age	Number of complete years of the head of the household
Household size	Number of people who live together in the same housing unit
Years of education	Total number of years of formal education of the household head
Yield	Volume of harvested crop per area (kg/acre)
Organic Fertiliser	Use of organic fertiliser. Dummy variable, organic fertiliser use =1, otherwise =0
Inorganic Fertiliser	Use of inorganic fertiliser. Dummy variable, inorganic fertiliser use =1, otherwise =0
Pesticide	Use of pesticides. Dummy variable, pesticide use =1, otherwise =0
Herbicide	Use of herbicide. Dummy variable, herbicide use =1, otherwise =0
Purchased seeds	Use of purchased seeds/seedlings. Dummy variable, seeds/seedlings use =1, otherwise =0
Irrigation	Use of irrigation. Dummy variable, irrigation use =1, otherwise =0
Rural/Urban location	Nature of the dwelling community of a household. Dummy variable, Urban =1, rural =0
Hired labour	Use of hired labour. Dummy variable, hired labour use =1, otherwise =0
Farm size	Total area of farm measured in acres

3.6.4 Descriptive statistics of the sampled households and farms

Table 3.7 and Table 3.8 present the descriptive statistics of the variables used in the analysis. The sample’s mean remittance amount received by households is GHS 272.28. About 30.80% of the sampled households have access to remittances, representing a smaller proportion of the sampled households with access to remittances. The average age of the household head in the sample is estimated at 48.76 years, with an average of 8.48 years of schooling. The average household size is 5 persons per household. About 75.67% of the household heads were males and 84.28% of the sampled households were rural households.

Regarding farm level characteristics, the average farm size in the sample was about 6 acres and the biggest farm size of 126.7 acres. The average yields of maize, cocoa and cassava were 290.18 kg/acre, 109.81 kg/acre and 672.81 kg/acre respectively. In terms of farm inputs, use of irrigation was very low in the sample. Only 1% of the sampled farmers used irrigation. About 54.81% and 47.772% of the farmers used of herbicides and hired labour respectively. Given the average age of a farmer of about 48.76 years, it is not surprising that the use of herbicides which is labour saving technology has high adoption and complemented by hired labour. About 45% of the farmers use fertilizers on their farms. The share of organic fertilizer use is very small (8.45%).

Table 3.7: Descriptive statistics of variables used

Variable	Mean	Std. Dev.	Min	Max
Remittances (GHS)	272.28	1,514.88	0	100,000
Age	48.76	15.52	16	99
Household size	5	3	1	28
Years of education	8.48	3.95	0	27
Farm size (acre)	6.01	7.3	0.017	126.7
Yield maize (kg/acre)	290.18	328.61	0	2700
Yield cocoa (kg/acre)	109.81	81.74	0	400
Yield cassava (kg/acre)	672.81	1218.35	0	16000

Table 3.8: Descriptive statistics of variables used

Variable	Frequency	Percentage
Male household head	5,688	75.67
Female household head	1,829	24.33
Rural households	6,335	84.28
Urban households	1,182	15.72
Remittance receiving households	2,315	30.80
Hired labour	3,567	47.72
Irrigation	79	1.06
Seedlings purchase	1,606	21.49
Herbicides	4,097	54.81
Insecticides	2,354	31.49
Organic fertilizer	632	8.45
Inorganic fertilizer	2,716	36.33

3.7 EMPIRICAL RESULTS

3.7.1 Propensity scores estimation and distribution

The estimation of propensity scores is a key step when using the propensity score matching technique in evaluation studies. The estimation of the treatment effect of access to remittances on productivity requires calculating the probability or propensity scores.

The propensity scores upon which the observed characteristics were balanced across the treated and control groups are estimated from probit models with dependent variables as remittance receipts, and measured as dummy variable.

Three separate probit models are estimated for the three selected crop farming household samples: maize, cassava and cocoa. The results of the probit models are presented in Appendices 3A to 3C. We use the `teffects psmatch` command in Stata to do the estimation. The `teffects psmatch` takes into account the propensity scores to estimate the treatment effects, unlike the `psmatch2` command, which that does not take into account that the propensity scores.

Before estimating the effects of remittances on the yields of the selected crops, it is important to test whether the overlap assumption has been satisfied and evaluated the quality of the matching propensity scores. Figure 3.4 - Figure 3.6 show the distribution of propensity scores among maize, cassava and cocoa farming households within the sample. The results show that the common support condition or overlap assumption is satisfied in all three models as there is a significant overlap in the distribution of the propensity scores of the treatment and control groups.

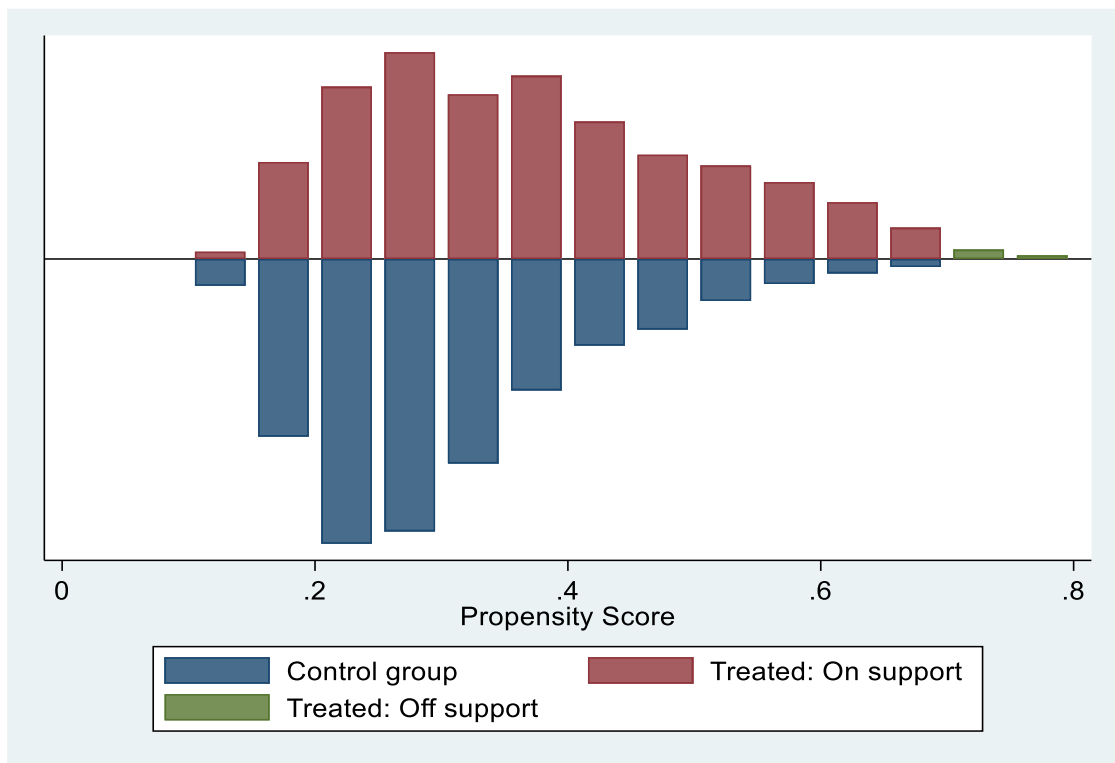


Figure 3.4: Distribution of propensity score among maize farmers without access to remittance (control group) and farmers with access to remittance (treatment group)

Note: “Treated: on support” indicates the observations in the treatment group that have a suitable comparison. “Treated: off support” indicates the observations in the treatment group that do not have a suitable comparison.

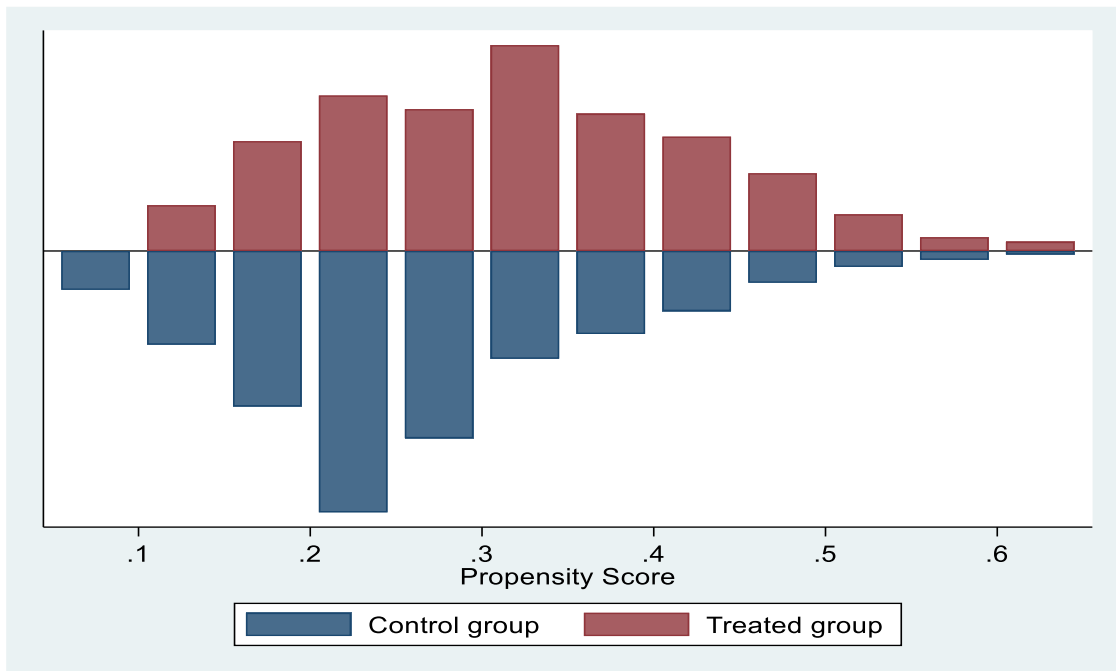


Figure 3.5: Distribution of propensity score among cassava farmers without access to remittance (control group) and farmers with access to remittance (treatment group)

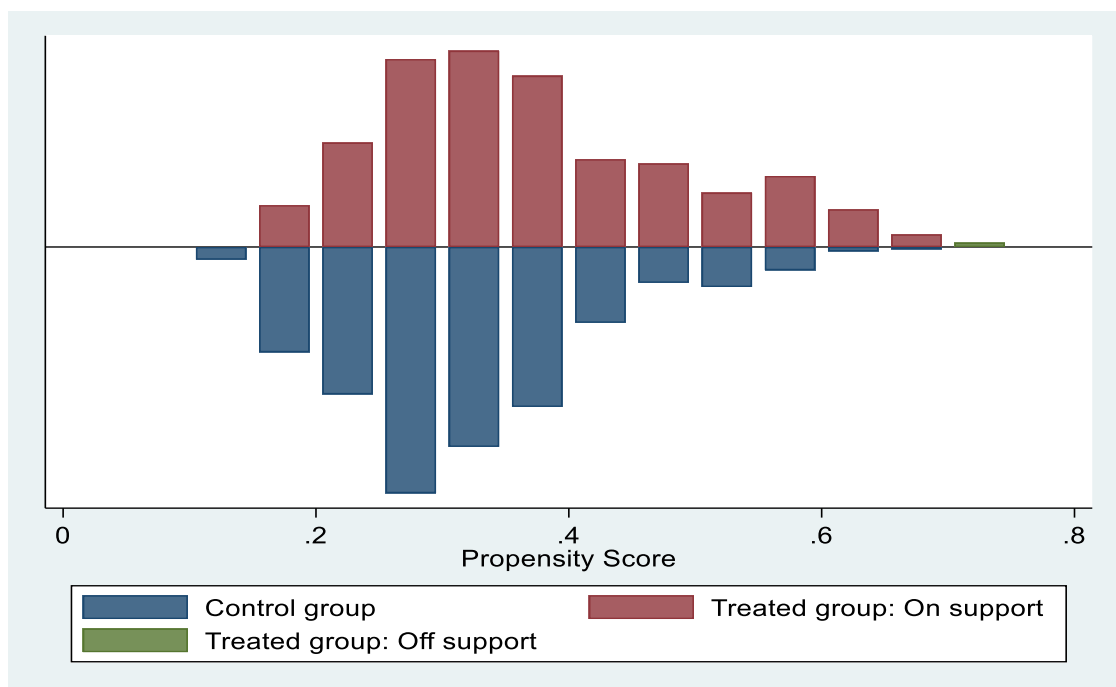


Figure 3.6: Distribution of propensity score among cocoa farmers without access to remittance (control group) and farmers with access to remittance (treatment group)

Note: “Treated: on support” indicate the observations in the treatment group that have suitable comparison. “Treated: off support” indicates the observations in the treatment group that do not have suitable comparison.

3.7.2 Covariates balancing test

Propensity score matching relies on conditioning on the propensity scores and not on all the covariates, therefore the study assessed whether the matching procedure could balance the distribution of the relevant variables in the control and treatment groups. Each household within the treated group (receiving remittance) and control group (without remittance) must have its covariates balanced based on the propensity scores.

This means, that both the treated and controlled groups must have the same or similar distribution, given the row of covariates. We test the covariate balancing using *pstest* and *tebalance summarize* STATA commands. We used *pstest* to compare the means between the variables for the treated and control groups while *tebalance summarize* was used to check for covariate balance over treatment groups after the matching.

The results of the comparison of means between the variables for the treated and control groups are presented in Table 3.9 - Table 3.11. According to Rosenbaum and Rubin (1983), the level of balancing achieved can be tested by conducting a t-test after the matching has been performed. The test allows to determine whether there are significant differences between the means of the covariates of the treated and control groups. Before matching, it is expected that there will be differences in the means, but after matching, there should not be any significant differences in the means of the covariates. From Table 3.9 - Table 3.11 we can conclude that the matching was successful because the characteristics of the matched households of the treatment and the control groups are similar. The means for all the covariates differ minimally.

The results of the covariate balancing tests are presented in Table 3.12. According to Stuart et al. (2013), a standardised difference of value between the range (0.1, 0.25) is an acceptable imbalance. The results indicate that the covariates used for the PSM estimations are all balanced for all crop groups. Furthermore, the standardised difference values are within the acceptable range of (0.1, 0.25). This means there is no selection bias when estimating the effects of remittances on the productivity of the selected crops in the study. The standardised differences are calculated for the raw data and the matched sample.

Table 3.9: Comparison of mean between the variables for the treated and control - maize

Variable	Unmatched Matched	Mean		%bias	%reduct bias
		Treated	Control		
Age	U	48.62	43.56	35.9	
	M	48.33	48.73	-2.9	91.9
Sex	U	0.734	0.880	-37.8	
	M	0.741	0.737	1.1	97.2
Years of education	U	8.475	8.340	3.4	
	M	8.475	8.587	-2.8	17.1
Household size	U	4.801	4.977	-6.3	
	M	4.809	4.985	-6.3	0.2
Inorganic fertilizer	U	0.385	0.405	-4.1	
	M	0.386	0.386	0	100
Organic fertilizer	U	0.086	0.101	-5.2	
	M	0.087	0.090	-0.9	81.7
Pesticide	U	0.338	0.361	-4.8	
	M	0.339	0.336	0.6	88.1
Herbicide	U	0.679	0.656	5	
	M	0.678	0.687	-2	59.1
Purchased seeds	U	0.284	0.250	7.7	
	M	0.282	0.269	3.1	59.4
Hired labour	U	0.629	0.528	20.5	
	M	0.627	0.599	5.6	72.6
Farm size	U	6.203	6.038	2	
	M	6.234	6.519	-3.5	-72
Rural/Urban location	U	0.171	0.194	-6.1	
	M	0.172	0.187	-3.9	35.5
Pseudo R2	Matched	0.003			
Number of obs.	treated	734			
	control	1,505			

Table 3.10: Comparison of mean between the variables for the treated and control - cassava

Variable	Unmatched Matched	Mean		%bias	%reduct bias
		Treated	Control		
Age	U	49.00	46.22	19.7	
	M	49.00	49.26	-1.8	90.9
Sex	U	0.672	0.809	-31.4	
	M	0.672	0.651	5	84
Years of education	U	8.681	8.254	11.2	
	M	8.681	8.297	10	10.1
Household size	U	4.328	4.525	-7.5	
	M	4.328	4.520	-7.3	2.5
Inorganic fertilizer	U	0.205	0.225	-4.8	
	M	0.205	0.262	-13.8	-186.7
Organic fertilizer	U	0.066	0.117	-17.9	
	M	0.066	0.052	4.6	74.4
Pesticide	U	0.301	0.435	-27.9	
	M	0.301	0.266	7.3	73.8
Herbicide	U	0.537	0.591	-10.8	
	M	0.537	0.511	5.3	50.9
Purchased seeds	U	0.205	0.227	-5.2	
	M	0.205	0.214	-2.1	59.4
Hired labour	U	0.511	0.431	15.9	
	M	0.511	0.511	0	100
Farm size	U	5.186	6.187	-16.2	
	M	5.186	5.324	-2.2	86.2
Rural/Urban location	U	0.153	0.193	-10.6	
	M	0.153	0.201	-12.7	-19.9
Pseudo R2	Matched	0.013			
Number of obs.	treated	229			
	control	593			

Table 3.11: Comparison of mean between the variables for the treated and control - cocoa

Variable	Unmatched Matched	Mean		%bias	%reduct bias
		Treated	Control		
Age	U	51.35	48.19	22.8	
	M	51.28	51.01	1.9	91.6
Sex	U	0.762	0.880	-31.1	
	M	0.765	0.705	15.8	49.4
Years of education	U	8.952	8.720	6.8	
	M	8.956	8.641	9.2	-35.4
Household size	U	4.068	4.476	-15.5	
	M	4.068	4.390	-12.3	21
Inorganic fertilizer	U	0.294	0.338	-9.5	
	M	0.295	0.283	2.6	73
Organic fertilizer	U	0.079	0.082	-1	
	M	0.080	0.072	2.9	-202.4
Pesticide	U	0.571	0.638	-13.6	
	M	0.570	0.574	-0.8	94
Herbicide	U	0.647	0.710	-13.5	
	M	0.649	0.633	3.4	74.8
Purchased seeds	U	0.123	0.152	-8.4	
	M	0.124	0.143	-5.8	31.3
Hired labour	U	0.683	0.598	17.7	
	M	0.681	0.633	10	43.4
Farm size	U	10.310	9.668	6	
	M	10.080	10.249	-1.6	73.7
Rural/Urban location	U	0.214	0.180	8.6	
	M	0.211	0.235	-6	30.3
Pseudo R2	Matched	0.012			
Number of obs.	treated	252			
	control	500			

Table 3.12: Covariate balance summary (standardised differences)

Covariates	Maize		Cassava		Cocoa	
	Raw	Matched	Raw	Matched	Raw	Matched
Age	0.359	-0.020	0.228	0.008	0.197	-0.039
Sex	-0.378	-0.007	-0.311	0.058	-0.314	0.012
Years of education	0.034	0.020	0.068	0.017	0.112	0.030
Household size	-0.063	0.013	-0.155	-0.030	-0.075	-0.007
Inorganic Fertiliser	-0.041	-0.014	-0.095	0.001	-0.048	-0.014
Organic Fertiliser	-0.052	0.002	-0.010	0.007	-0.179	-0.006
Pesticide	-0.048	-0.015	-0.136	-0.037	-0.279	-0.027
Herbicide	0.050	-0.017	-0.135	-0.029	-0.108	-0.037
Purchased seeds	0.077	-0.001	-0.084	0.034	-0.052	-0.033
Hired labour	0.205	0.021	0.177	0.039	0.159	0.016
Farm size	0.020	-0.007	0.060	0.014	-0.162	-0.070
Rural/Urban location	-0.061	-0.018	0.086	-0.011	-0.106	0.020
Number of observations	2,239	4,478	822	1,644	752	1,504
Number of treated groups	734	2,239	229	822	252	752
Number of control groups	1,505	2,239	593	822	500	752

3.7.3 Effects of access to remittance on agricultural productivity (ATET)

The estimated effect of receipt of remittances on crop productivity for tradable and non-tradable crops is presented in Table 3.13.

The results show a significant negative impact of access to remittance on maize and cocoa productivity of the farming households in the sample. On the other hand, the estimated treatment effect of remittances on cassava was positive but not statically significant. The results indicate that, both maize and cocoa farming households that received remittances had less yield than households that did not receive remittances. On average, maize farming households that received remittances had maize yields of about 37 kg/acre less than maize farming households that did not receive remittances. Similarly, on average,

cocoa farming households that received remittances had cocoa yields of about 126 kg/acre less than cocoa farming households that did not receive remittances.

Table 3.13: Treatment-effects estimation of remittance on crop productivity

Estimators (ATET)	Maize		Cassava		Cocoa	
	Coef.	SE	Coef.	SE	Coef.	SE
Propensity score matching (PSM)	-37.680**	18.981	87.121	87.813	-126.96**	64.789
Nearest neighbour matching (NNM)	-35.328*	16.454	130.189	99.979	-102.854	77.794
Number of observations	2,238		820		752	

Notes: Significance *p<0.1; **p<0.05; ***p<0.01.

The result for maize and cocoa is consistent with some existing studies in developing countries found that the effect of receiving remittances as a non-labour source of income could result in a state of dependency, thereby reducing the labour market participation of the recipient households and their production activities (see Lipton, 1980; Berker, 2011; Dedewanou & Tossou, 2022).

Furthermore, the negative relationship between remittances and agricultural productivity confirms similar results by Akudugu (2016), who found a negative but insignificant relationship between remittances and productivity. The results, however, contradict findings from other studies such as Huy and Nonneman (2016), Rozelle et al. (1999) and Kapri and Ghimire (2020). The results fail to confirm the NELM theory that states that remittances receiving households can overcome production and investment constraints to increase production.

It could also be argued that the negative relationship is not necessarily due to a reduction in the labour market participation of the recipient households and their production activities as cited above but rather, the recipient households could diversify into other crop production activities and/or non-farm enterprise activities. We try to control for this by assessing whether there are differences in the effect of remittances on crop

productivity when the household is engaged in the cultivation of other crops or engaged in non-farm enterprise activities. The underlying assumption is that the non-farm enterprise and the cultivation of other crops by the household could influence the production decision on the major crop cultivated.

Table 3.14 presents the effect of remittances on the productivity of maize, cassava and cocoa while controlling for the effects of remittances when households engage in non-farm enterprise and other crop cultivation. From the results we noted that the effect on maize production, which is suitable across all agroecological zones, remained negative when we controlled for non-farm enterprises and agroecological areas.

Similarly, the effect on cassava remained insignificant. However, the effect on cocoa yield also became insignificant, implying that for cocoa farmers with remittances, switching to other economic activities did not make a difference to yield. For maize farmers, receiving remittances resulted in a switch of labour away from maize, thereby reducing yield.

The insignificance of the impact of remittances on cocoa after controlling for other crops and non-farm economic enterprise activity could be explained as follows: Compared to a remittance-receiving cocoa farmer who is not engaged in other economic activities, the remittance-receiving cocoa farmer who is engaged in other economic activities can optimise the use of the remittance across economic activities with no significant impact on cocoa yield, bearing in mind that cocoa itself has a longer gestation (3 to 5 years) and the yield is not immediate.

In the case of maize, the persistently negative impact on yield remained even when we controlled for maize farmers engaged in other crop and non-farm activities. It could be a case of a switch into a consumption activity, or a consistent case of remittances, offering farmers a better opportunity to diversify away from maize into other crops and/or non-farm enterprises. It is important to add that maize, amongst the most unproductive crops in Ghana with less than 50% of its potential yield, may become unattractive for a

remittance-receiving farmer who uses the remittance to switch to other crops and/or non-farm economic activities other than maize.

For further robustness, we used the nearest neighbour matching (NNM) estimator to estimate the effect of remittances on productivity to check for the robustness of the estimates derived using the PSM. The treatment effects results from the NNM estimator were similar to the PSM. This shows that the estimated treatment effect using the PSM was robust.

Table 3.14: Treatment-effect estimation of remittance on crop productivity when households engage in non-farm enterprise and other crops cultivation (ATET)

Crop	Coef.	Std. Err.	Prob.	No. Obs.
Maize	-37.759**	18.998	0.047	2,238
Cassava	91.928	95.055	0.333	820
Cocoa	-74.307	61.576	0.228	752

Notes: Significance *p<0.1; **p<0.05; ***p<0.01.

3.7.4 Rosenbaum sensitivity analysis

As Nordjo and Adjasi (2019) noted, the PSM is an effective estimation technique for cross-sectional samples due to its ability to control for a selection bias on the observables.

The PSM estimation has its limitation when there is the presence of hidden bias after controlling for the set of observable characteristics (Cerulli, 2015). The presence of a hidden bias made the results of the PSM estimator inconsistent. The study used the Rosenbaum bounds method to test for the effect of hidden bias (unobserved covariates) on the outcome (productivity). According to Sanglestsawai et al. (2015), the results are sensitive to the effects of a hidden bias if the significance value is close to one.

The results from the Rosenbaum bounds test presented in Table 3.15 show the degree of sensitivity of the effect of a hidden bias on the results of the estimation of the treatment effect of remittances on the productivity of maize, cassava and cocoa farming households.

From the results, all the significance values (Sig+) were close to zero for all the critical levels of gamma within the range (1,2). According to Sanglestsawai et al. (2015), when the significance level is less than or equal to 0.05, it is sufficient to conclude that there is no effect of hidden bias in the estimation of the treatment effect.

Therefore, the results of the Rosenbaum bounds test showed no hidden bias in the estimation of the treatment effect in this study; therefore, the results show a causal effect of remittance receipt on the productivity of maize and cocoa.

Table 3.15: Rosenbaum bounds sensitivity analysis for hidden bias

Gamma (Γ)	Maize		Cassava		Cocoa	
	Sig+	Sig-	Sig+	Sig-	Sig+	Sig-
1	0.000	0.000	0.000	0.000	0.000	0.000
1.1	0.000	0.000	0.000	0.000	0.000	0.000
1.2	0.000	0.000	0.000	0.000	0.000	0.000
1.3	0.000	0.000	0.000	0.000	0.000	0.000
1.4	0.000	0.000	0.000	0.000	0.000	0.000
1.5	0.000	0.000	0.000	0.000	0.000	0.000
1.6	0.000	0.000	0.000	0.000	0.000	0.000
1.7	0.000	0.000	0.000	0.000	0.000	0.000
1.8	0.000	0.000	0.000	0.000	0.000	0.000
1.9	0.000	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000

Notes: gamma - log odds of differential assignment due to unobserved factors
 sig+ - upper bound significance level
 sig- - lower bound significance level

3.8 CONCLUSIONS AND RECOMMENDATIONS

The paper assessed the effects of remittances on Ghana's agricultural productivity using the most recent nationally representative cross-sectional household survey data. We also assessed whether heterogeneity in farming households' economic activity affected remittances' effects on productivity. Our innovation in this paper is to disaggregate the effect on productivity based on the tradability of the crop: using maize, cassava (non-tradable) and cocoa (tradable) producing households.

To control for selection bias in the estimation, the study used a PSM estimator to estimate the treatment effect of remittances on crop productivity. The PSM compared the mean yield of the treated group (farming households that received remittances) with the mean yield of the control group for the tradable and non-tradable crops. The covariates used for the PSM estimations are all balanced for all the crop groups indicating the absence of selection bias when estimating the effects of remittances on the productivity of the selected crops in the study. The results showed that households receiving remittances had lower agricultural productivity in Ghana both for tradable and non-tradable crop producing households in the sample.

The effect of remittance receipt on maize productivity was negative when we controlled for heterogeneity in the economic activity of farming households. The findings suggest that maize farmers who received remittances may be switching into consumption activity or diversifying away from maize production into other crops and/or non-farm enterprises.

Maize is one of the key staple crops in Ghana which has the potential to enhance Ghana's food self-sufficiency targets. Agricultural policy must therefore target maize farmers to increase their access to productivity enhancement inputs to help close the existing productivity gap. The remittance receiving cocoa farmer who is engaged in other economic activities can optimise the use of the remittance across economic activities with no significant impact on cocoa yield.

The findings from the study indicated that receipt of remittance did not result in increased productivity of the crops under cultivation. This provides insight into the possible allocation of remittances among non-farm activities by the remittance receiving agricultural households. The study recommends that policymakers should pay attention to removing all obstacles that may prevent remittance recipient agricultural households from investing in agriculture. In addition, public and private extension service providers should include financial literacy modules in the farmer training modules to increase farmers' knowledge on investment of remittance in agricultural production.

APPENDICES

Appendix 3A: Probit model for receiving remittance by maize farming households

Explanatory variables	dy/dx	Std. Err.	Prob.
Age	0.005	0.001	0.000
Sex	-0.220	0.030	0.000
Education	0.006	0.003	0.027
Household size	-0.004	0.004	0.302
Inorganic Fertiliser	0.014	0.022	0.535
Organic Fertiliser	-0.012	0.034	0.739
Insecticides	-0.026	0.022	0.232
Herbicides	0.025	0.022	0.266
Seedling purchase	0.037	0.024	0.119
Hired labour	0.070	0.021	0.001
Farm size	0.001	0.001	0.631
Rural/Urban	-0.057	0.025	0.024
No of Observations		2,238	
LR chi2(11)		152.75	
Prob > chi2		0.0000	

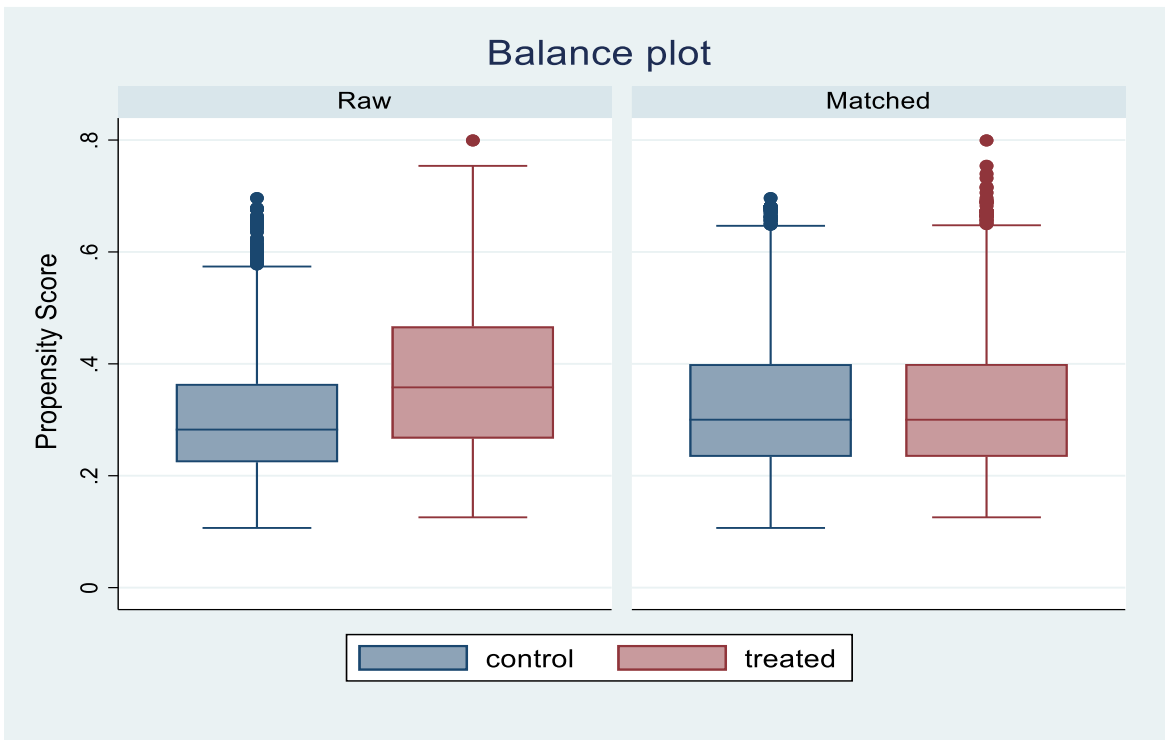
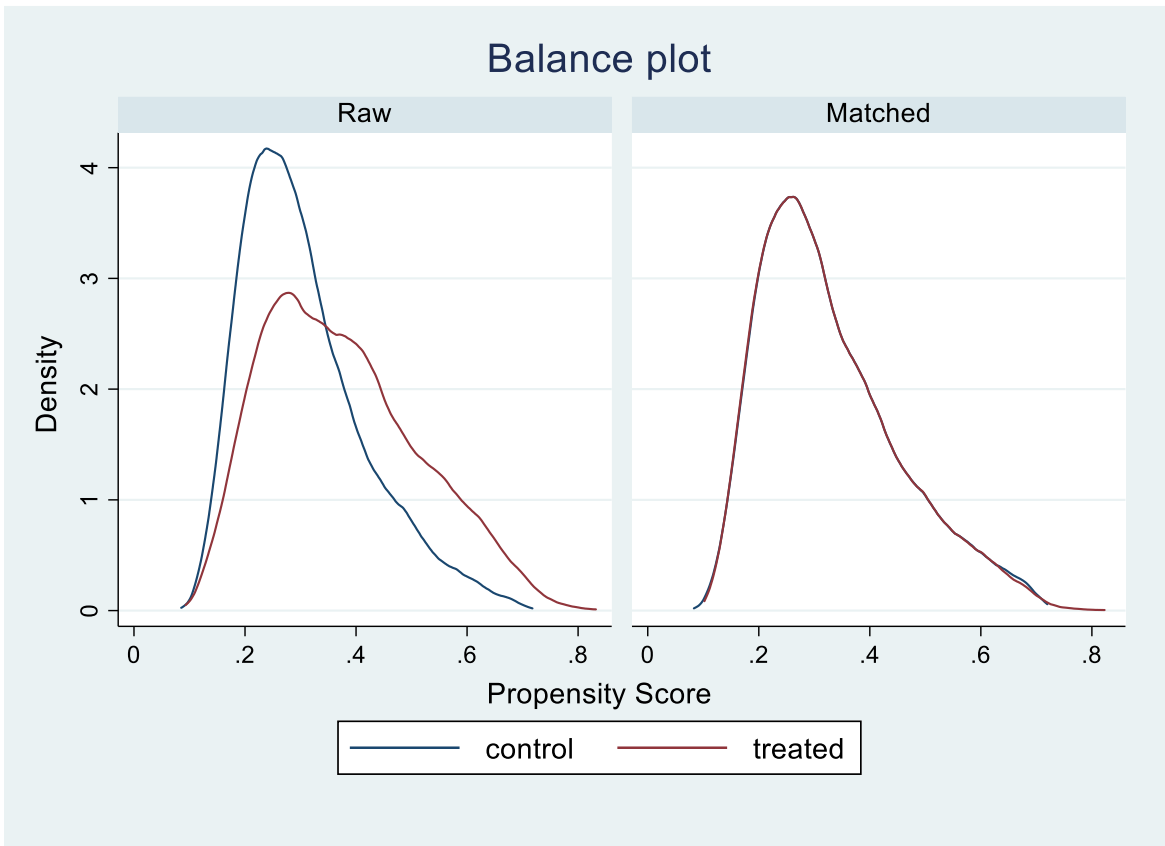
Appendix 3B: Probit model for receiving remittance by cassava farming households

Explanatory variables	dy/dx	Std. Err.	Prob.
Age	0.002	0.001	0.056
Sex	-0.155	0.043	0.000
Education	0.011	0.004	0.009
Household size	-0.004	0.006	0.505
Inorganic Fertiliser	0.022	0.042	0.600
Organic Fertiliser	-0.085	0.049	0.082
Insecticides	-0.080	0.035	0.023
Herbicides	-0.014	0.034	0.689
Seedling purchase	-0.018	0.039	0.643
Hired labour	0.079	0.033	0.018
Farm size	-0.003	0.003	0.257
Rural/Urban	-0.073	0.039	0.057
Constant	0.002	0.001	0.056
No of Observations		820	
LR chi2(11)		49.47	
Prob > chi2		0.0000	

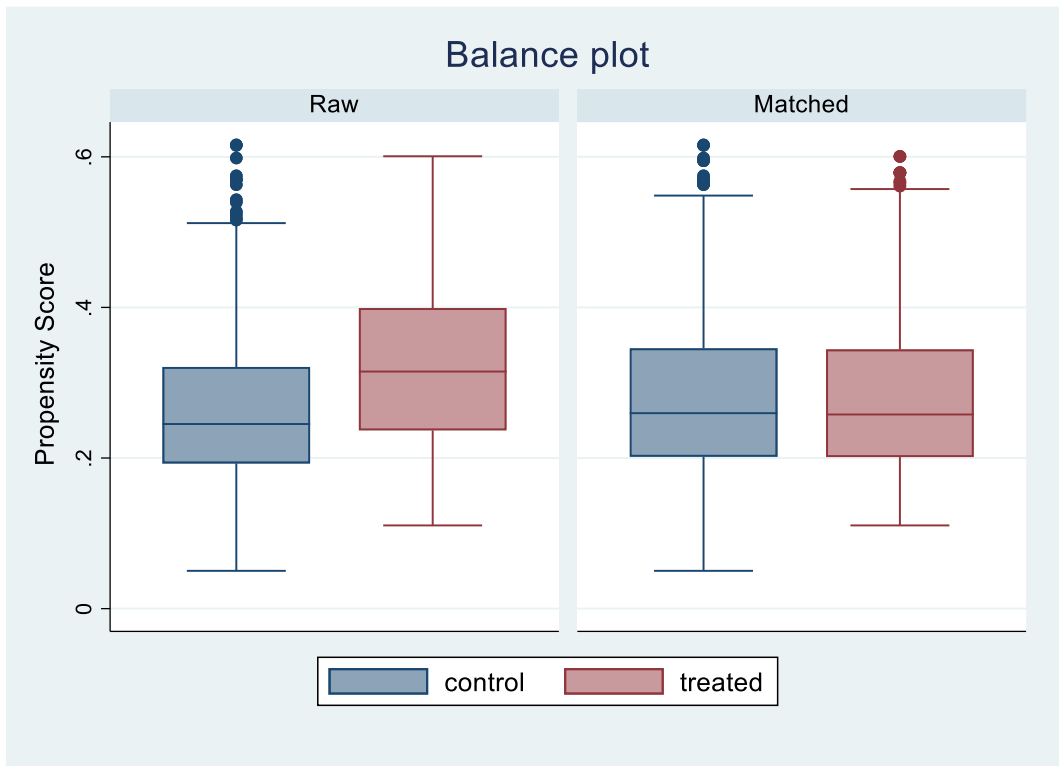
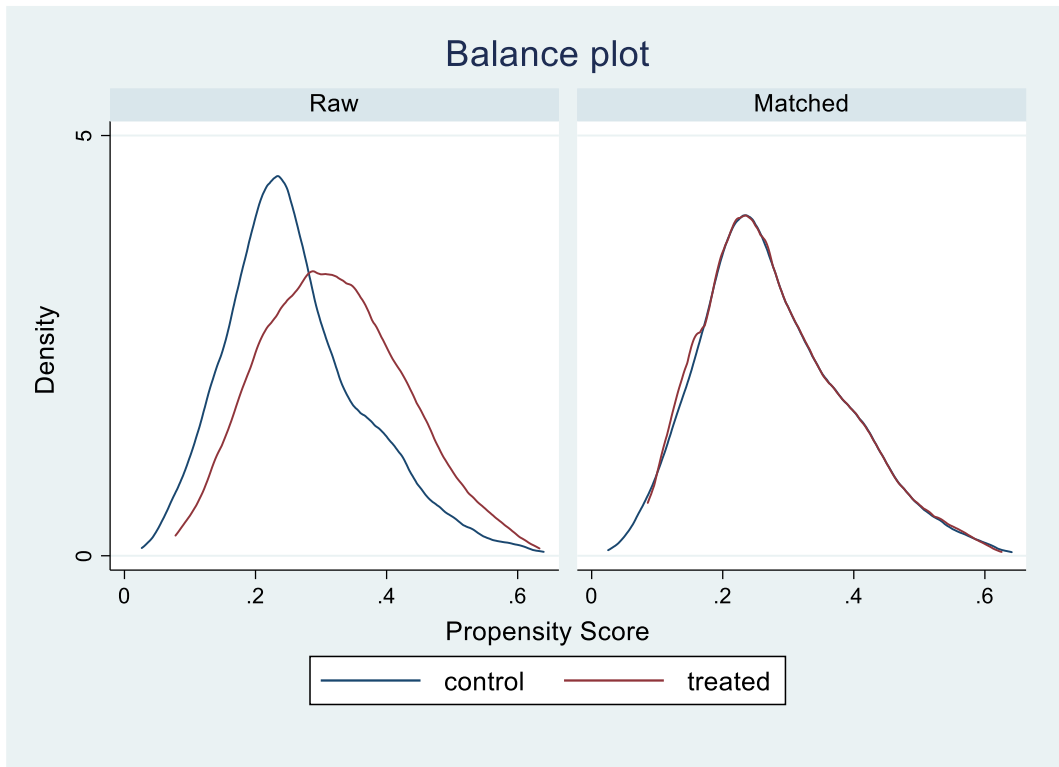
Appendix 3C: Probit model for receiving remittance by cocoa farming households

Explanatory variables	dy/dx	Std. Err.	Prob.
Age	0.003	0.001	0.037
Sex	-0.191	0.052	0.000
Education	0.006	0.005	0.266
Household size	-0.011	0.007	0.118
Inorganic Fertiliser	-0.017	0.040	0.67
Organic Fertiliser	0.001	0.065	0.985
Insecticides	-0.053	0.041	0.204
Herbicides	-0.044	0.042	0.303
Seedling purchase	-0.041	0.050	0.408
Hired labour	0.113	0.038	0.003
Farm size	0.001	0.002	0.414
Rural/Urban	0.024	0.046	0.608
Constant	0.003	0.001	0.037
No of Observations		752	
LR chi2(11)		41.36	
Prob > chi2		0.0000	

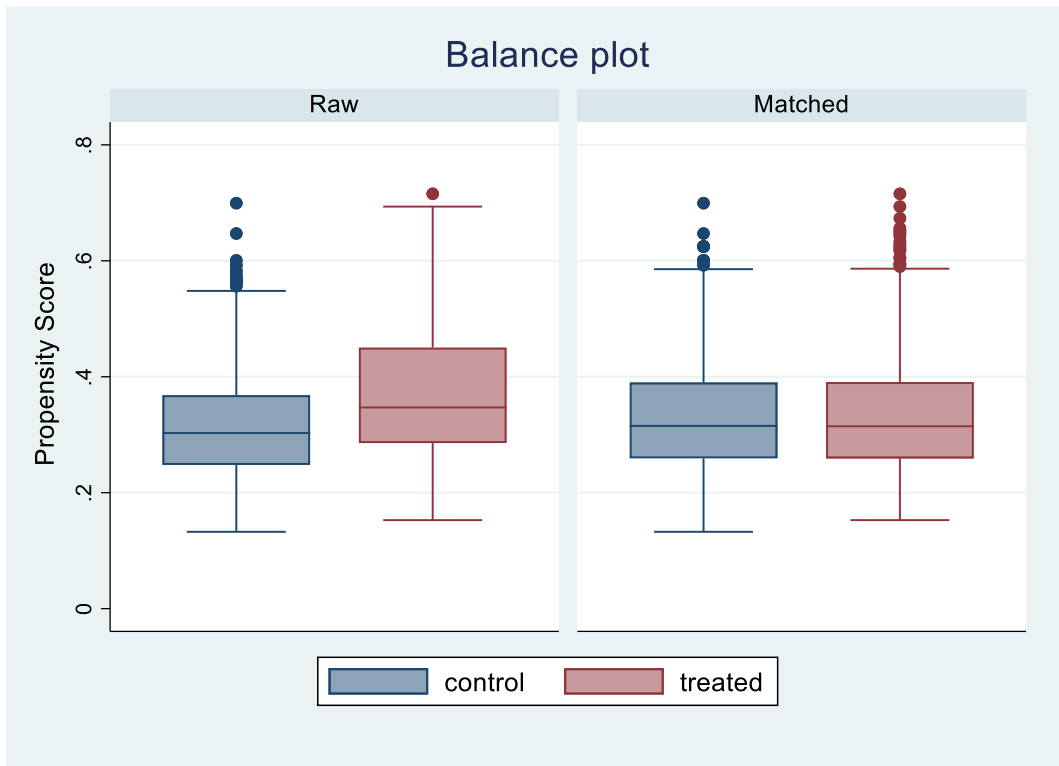
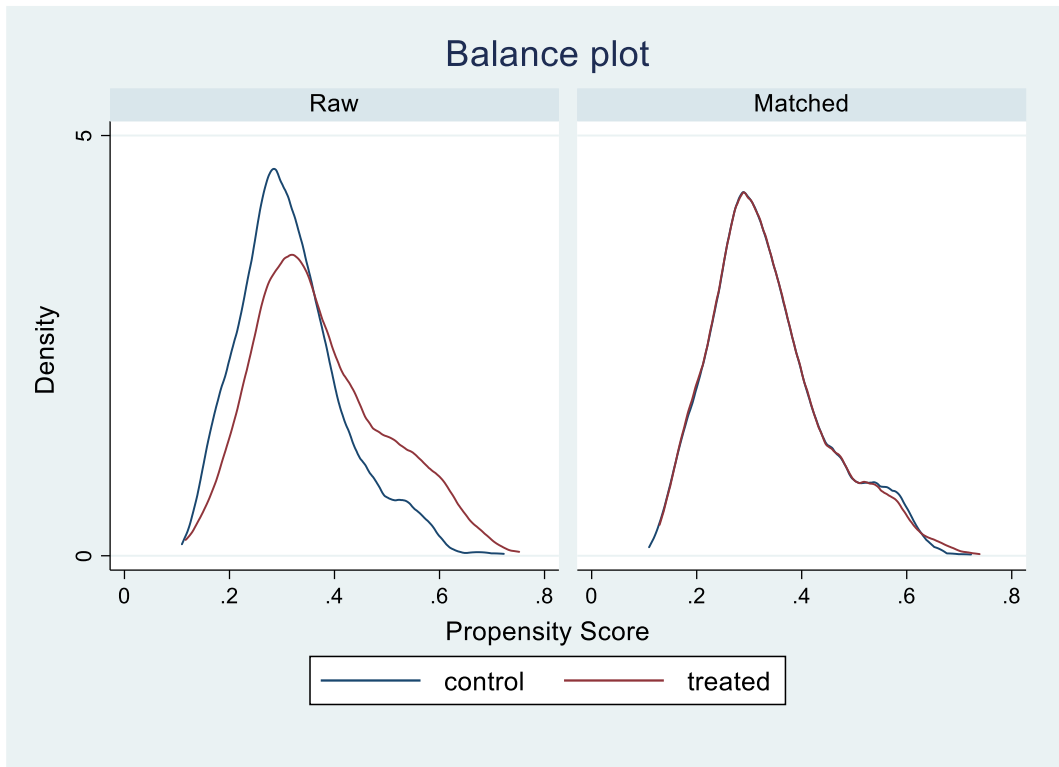
Appendix 3D: Balanced density plot for maize farming households



Appendix 3E: Balanced density plot for cassava farming households



Appendix 3F: Balanced density plot for cocoa farming households



CHAPTER 4: REMITTANCES AND AGRICULTURAL HOUSEHOLD WELFARE IN THE GAMBIA

4.1 INTRODUCTION

Remittances can help households manage their exposure to income risks, improve household welfare through income and consumption smoothing, with asset accumulation and insure them against shocks (Adams, 1998; Jones, 1998; Adams & Page 2005; Amuedo-Dorantes, & Pozo, 2014; Sayeh & Chami, 2020). Money sent by migrant workers abroad to their countries of origin is an important source of finance for many developing countries (Joof & Touray, 2021).

In 2020, remittance flow to low and middle-income countries reached \$540 billion (Ratha et al., 2021). Remittance flow to developing countries continues to exceed foreign direct investment flows.

In terms of remittance contribution to national economies, out of 10 countries with high remittances contribution to GDP (ranging from 5.6% to 20.6%), West Africa has seven countries while the remaining three countries are from Southern Africa. It was also argued by Joof and Touray (2021) that, the share of remittances to GDP in The Gambia placed the country among the highest recipients of remittances in sub-Saharan Africa when compared to the size of the economy.

Remittances have the potential of having positive impacts on poverty, smoothing consumption expenditure, and help reduce income inequality in developing countries (Adams & Page, 2005; Ahmed et al., 2010; Amuedo-Dorantes & Pozo, 2014; Munyegera & Matsumoto, 2016; Adebayo et al., 2021).

Data published by the Central Bank of The Gambia indicate that remittances contributed to 18% of the GDP of The Gambia's Economy in 2019. Despite the importance of remittances in The Gambia, its impact on households and the economy has not been thoroughly investigated (Joof & Touray, 2021). Meanwhile, poverty rates in The Gambia are one of the highest in the world. The United Nations Development Programme's

(UNDP) human development indicators (HDI) ranked The Gambia 172 out of 189 countries across the globe.

Since remittances are direct transfers to households, the question arises if remittances could be one of the capital flows to improve household welfare in The Gambia?

In The Gambia, the agricultural sector accounts for about 80% of the rural population's primary livelihood source and contributes to about 30% of national foreign exchange earnings (GBOS, 2017). The productivity of all major crops in The Gambia is lower than the West African yields, and even with the lower yields, there continues to be a decline over time (Mungai & Amouzou Agbe, 2019). This phenomenon leaves farmers in The Gambia to be poor and vulnerable. Meanwhile remittances could contribute to the development of the local agricultural economy and improve the welfare and livelihoods of the receiving households (Nwaru et al., 2011; Adebayo et al., 2021).

The Gambia is one of the poorest countries in the World, with a national poverty rate of 48.6 in 2015, a situation which may result in a substantial proportion of the population being highly vulnerable to poverty. It is, at the same time, one of the highest recipients of remittance inflows in Africa; in fact, on a per capita basis, The Gambia ranks 5th in sub-Saharan Africa with a per capita of \$123.11 in 2020.

Following the literature on remittances as a welfare enhancement tool and the context of The Gambia – a highly agrarian economy with high poverty and high remittances – a critical question arises: can remittances enhance the welfare of households in The Gambia? Unfortunately, the empirical literature provides very little information about this.

Using the World Bank's Living Standard Measurement Survey data from The Gambia, the study examined the relationship between remittances and welfare amongst agricultural households. The study focused on agricultural households because poverty is higher in the rural areas of The Gambia where agriculture is the predominant economic activity of the population.

The welfare effect of remittances could be distributed according to household income levels, and there may be a reverse causality issue between welfare and remittances.

To account for these, we use instrumental variable quantile regression. Furthermore, we controlled for the distributional income/welfare effect in estimating remittances' effect by employing quantile regression techniques. This helps reveal the dynamic trends across different income or welfare levels and is easily hidden in a regression that concentrates on the distribution average.

Bang et al. (2016) noted that there is less consensus regarding the extent to which remittances impact the recipient country's most vulnerable population. Understanding the effects of remittances on different segment of income distribution of the population, especially the lower tail will explain the distributional benefits of remittance on the mean income levels.

A major limitation to most existing studies on the effect of remittances on welfare is the assumption that the effect of remittance along the distribution of household consumption is the same (Keho, 2017). This study will add to the limited empirical knowledge on the role of remittances in The Gambian economy and help inform and guide policy formulation and implementation. In addition, it makes a significant contribution to the literature by estimating the distributional welfare effects of remittances on household welfare in The Gambia, a country with a high remittance flow and high poverty, where relatively little is known about the impact of remittance on poverty.

An additional contribution of this paper is the understanding of remittance effect on smallholder agricultural households in high poverty contexts. Studies on the distributional effect of remittances focus on the entire household and reveal less on agriculturally based households. The effect of remittances could differ according to whether the household is in a high or low-income earning activity. In Africa agriculture is on a smallholder basis and a low-income earning activity. In such contexts although remittance may increase welfare, the distributional effects may be different. For small high poverty and yet high receiving remittance contexts like The Gambia, where 80% of households dwell on agriculture, this provides a unique case worth studying. In this paper

we show that domestic remittances have no significant effect on welfare whilst remittances of international origin positively increase welfare of agricultural households but with the relatively richer households benefitting more.

The remaining part of the paper is organised as follows: Section 4.2 provides a brief overview of role of remittances in The Gambia; Section 4.3 presents the literature review while Section 4.4 presents the methodology; results and conclusions of the Chapter are presented in Sections 4.5 and 4.6 respectively.

4.2 OVERVIEW OF AGRICULTURE, REMITTANCES AND HOUSEHOLD WELFARE IN THE GAMBIA

Agriculture is one of the key sectors in The Gambian economy and a key priority area of national development. In 1996, the government adopted The Vision 2020, the national development plan for a 25-year period. The government formulated the Programme for Accelerated Growth and Employment (2012 - 2015) to prioritise investment in agriculture, health, and education in its effort to reduce poverty in rural areas.

To deliver on government commitments toward agricultural development in The Vision 2020, the government introduced the 2009-2015 Agriculture and Natural Resources Policy (ANRP) to transform the country's agriculture into a robust, market-oriented sector. Agriculture is listed as a strategic priority in the National Development Plan (2018 – 2021). Despite the strategic importance of the agricultural sector in The Gambia, the sector is plagued with several challenges, including low productivity. Mungai and Amouzou Agbe (2019) indicates that higher agricultural growth is achievable in The Gambia by closing the productivity gap with neighbouring countries.

Agriculture in The Gambia is mainly characterised by subsistence production of food crops by smallholder farmers under rain-fed condition. Data from FAOSTAT indicates that the main food security crops produced in The Gambia are rice (16%), millet (28%), maize (11%) and sorghum (8%) (FAO, 2021). The main cash crop produced in The Gambia is groundnuts (29%) (FAO, 2021). The productivity of all major crops in The Gambia is lower than the West African yields, and even with the lower yields, there is a continuous decline over time (Mungai & Amouzou Agbe, 2019).

The low productivity of agriculture in The Gambia is influenced by climate change, low use of fertiliser application and low-yielding seed varieties (Mungai & Amouzou Agbe, 2019). The sector's low productivity results in low returns, leading to high poverty among farming households in The Gambia.

The United Nations Department of Economic and Social Affairs' Population Division estimates that about 9.2% of The Gambia's 2.3 million population lived abroad in 2019. As shown in Figure 4.1, private remittance inflows to The Gambia have increased by 139% within the past decade, from \$115 million in 2010 to \$275 million in 2019. The World Bank estimated private remittance flows to The Gambia at 15% of GDP in 2019. With such a high remittance ratio to GDP, the impact of remittances on consumption and investment cannot be underestimated. The World Bank indicates that one in four households receive international remittances in The Gambia. Avdiu and Meyer (2021) estimated that 16% of The Gambian households reported that foreign remittances were among the three most important sources of annual income.

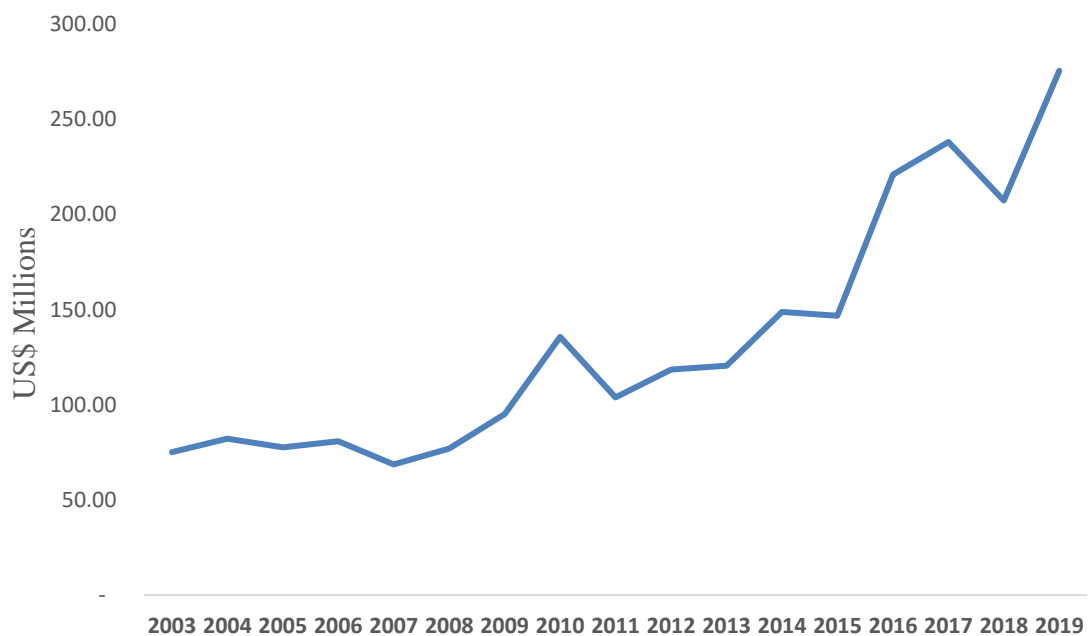


Figure 4.1: Annual remittance inflows to The Gambia (deflated with US CPI)

Source: World Bank Annual Remittances Data (updated as of May 2021)

The Gambia’s Human Development Index (HDI) value for 2019 was 0.496. This HDI value ranks The Gambia 172nd out of 189 countries across the globe, making The Gambia one of the poorest countries in the world.

Between 1990 and 2019, The Gambia’s HDI value increased from 0.349 to 0.496, an increase of 42.1% (UNDP, 2020). However, the HDI value of The Gambia has remained, at all times, below the average of sub-Saharan Africa’s HDI value from 1990 to 2019. Similarly, the GNI per capita in purchasing power parity (PPP) in international dollars at 2017 constant prices of The Gambia has remained below the average sub-Saharan Africa GNI per capita (2017 PPP\$). This indicates that the standard of living in The Gambia is lower than the average in sub-Saharan Africa.

From the aforementioned it is evident that The Gambia is an interesting case of high remittances amidst high poverty and but the effect of remittance flow on household poverty remains to be empirically tested.

Table 4.1: The Gambia’s HDI and GNI trends versus sub-Saharan Africa

Year	GNI per capita (2017 PPP\$)		Human Development Index	
	The Gambia	SSA	The Gambia	SSA
1990	2,257	2613	0.349	0.404
2000	2,191	2451	0.403	0.426
2010	2,307	3298	0.459	0.501
2015	2,009	3721	0.471	0.535
2016	1,999	3683	0.475	0.534
2017	2,034	3678	0.480	0.542
2018	2,106	3672	0.487	0.544
2019	2,168	3691	0.496	0.547

Source: Briefing note for countries on the 2020 Human Development Report, The Gambia.

In the absence of robust evidence, a knowledge and policy gap is created on the usefulness of remittances. This further justifies testing the empirical relationship between

remittances and household welfare in The Gambia. It is expected that it will add to existing knowledge on the role of remittances in household welfare and help inform and guide policy.

4.3 LITERATURE REVIEW

Welfare is a complex phenomenon which includes several dimensions such as liberty, health, life-expectancy, cost of living, education among many others. The multi-dimensional nature of welfare makes it difficult to use a simple monetary measure to capture it (Deaton & Zaidi, 2002). The welfare derived from the consumption of goods and services that are not traded on the open market such as quality breathing air and public basic education is also difficult to quantify. The difficulty in measuring welfare in its entirety cannot be over emphasized, hence economic definition of living standards is often used (Deaton and Zaidi, 2002). The cost of living index measures the relative cost of reaching a given standard of living under two different situations.

Different measures have been used to analyze welfare of households. One measure of welfare is the use of subjective well-being, which involves the respondents' own rating of its economic situation (Andersson, 2014). This approach is not popular in literature as it is very subjective. Andersson (2014) showed that remittances have a significant impact on welfare measured through subjective well-being. The subjective well-being according to Andersson (2014, p. 3), *“captures a broader dimension of household wellbeing compared to measures such as expenditures or consumption, as the household can include not only the immediate benefits of an income increase but also expectations about future consumption, investments (both short-term and more long-term such as investments in health and education of children) and savings that the migration and remittances might generate”*.

Objective measures of welfare used in literature are household assets holding or accumulation, poverty, and consumption expenditure (Raihan et al., 2009; Andersson, 2014; Amuedo-Dorantes & Pozo, 2014; Munyegera & Matsumoto, 2016; Adebayo et al., 2021). Some studies disaggregate assets into productive and consumer asset (see Andersson, 2014). Raihan et al. (2009) studied the impact of remittances on household welfare in Bangladesh using a cross-section econometric analysis to explore the links

between remittances and poverty at the household level using the Household Income and Expenditure Survey (HIES) data. The authors found that remittances had a positive impact on household consumption and that household real consumption declined by more than 3% because of the reduction in remittances.

The data used by studies to analyze the impact of remittances on welfare varies in the literature. All three types of data: Cross section (see Andersson, 2014; Raihan et al., 2009), Time series, and Panel (see Adams, 1998; Keho, 2017; Cuong and Linh, 2018) are used for analysis.

Selection bias and endogeneity are common methodological problems in remittances and migration studies. There is often selection bias in the samples used to analyze remittances studies. Households receiving remittances are not random, households self-select themselves based on several factors to send a member of the household to other locations to seek greener pastures.

The second problem is endogeneity of remittances and migration. Most factors that explain migration decisions or remittance receipts also explain other household outcomes simultaneously. Again, there are some other factors that are difficult to measure and include in the analysis of migration studies, for example, ambitious individuals are likely to migrate and remit, yet it is difficult to measure ambition as a variable for analysis. These make it difficult to accurately determine the casual effects of migration and remittances (Adams, 2011).

The best solution to the aforementioned problems is to use randomized controlled experiments, where remittances are randomly assigned to one of two similar groups and the difference in outcome between the two groups observed. However, in the absence of a randomized remittance assignment such as is the case of the household data for Gambia, other econometric and pseudo experimental methods can be used to control for the identification problems of selection and causality.

Adams (2011) cites that the use of panel data in estimations could help overcome these methodological problems. Panel data includes repeated observations or respondents over

two or more time periods, which makes it easier to eliminate many biases that results from endogeneity and selectivity by taking ‘first differences’ between various variables (Adams, 2011). Cuong and Linh (2018) using fixed-effects regressions and panel data from the Vietnam Household Living Standard Surveys 2010 and 2012 resolved the endogeneity bias in their analysis. The use of fixed effects regression helped to eliminate unobserved variables that are time-invariant during the panel data period.

Another solution proposed in the literature to overcome migration and remittance estimation problems is by using the propensity score matching (PSM) technique. PSM involves the construction of a counterfactual situation based on observed characteristics of a control group and actual migrant households to compare their outcomes.

Adams (2011) criticised this method, stating that it ignores the problem of selection; hence it is unclear if the results produced are the best. Clément (2011) provided a strong justification for using PSM to reduce selection bias linked to observed differences in the socioeconomic characteristics between remittance recipients and nonrecipient households. Clément (2011) and Wadood and Hossain (2017) quantified the average effect related to the receipt of remittances by matching remittance-receiving households with households with similar characteristics that do not receive remittances to correct self-selection bias in their Tajikistan and Bangladesh studies respectively.

The use of Heckman two stage model is also proposed as a solution to overcome the problem of selection bias. According to Heckman (1979), the model is best used for assessing non-randomized programs and uses a two-step estimation approach to correct for participants’ self-selection bias and selection bias due to program placement. These two-step equations are the selection equation and the outcome (regression) equation.

Acosta et al. (2008) employed the two-stage Heckman model to self-selection bias to assess the impact of remittances on poverty in Latin American countries. The results of their study found a positive impact of remittances on poverty in the 10 sampled study countries.

The use of the Heckman two stage procedure to correct for self-selection is not always reliable though. For instance, Adams, (1998) used the Heckman two stage procedure to

study the relationship between remittances and rural asset accumulation in Pakistan but the results produced were very poor and unreliable. Amuedo-Dorantes and Pozo (2014) criticize the use of Heckman model as being sensitive to identification exclusions because it may be difficult to identify all factors that affect the likelihood of remittance receipts.

Another solution identified in literature is the use of instrumental variables in estimation procedure. The instrumental variable method involves identifying another variable as a substitute in the model. The instrument to be used must be highly correlated with the independent variable but uncorrelated with the outcome variable, except only through the explanatory variable. This method eliminates biases resulting from endogeneity and sample selection.

There is usually a challenge of identifying instrumental variables for estimations, however, the strength and validity of instruments can be tested using identification tests.

Amuedo-Dorantes and Pozo (2014) addressed endogeneity of remittance income in Mexican household data using instrumental variable approach where the study instruments remittance income with predicted values derived from models of remittance flows. Ahmed (2020) used the instrumental variable approach to assess the impact of migration on households' welfare in Bangladesh by controlling for endogeneity in the estimation procedure.

Several studies across different regions show that remittances are used to support consumption, healthcare and education expenses and augment household savings. For example, a study in the Philippines found that remittances were used as insurance against income shocks that resulted from a severe drought, accounting for about 60% of household consumption expenditure (Yang & Choi, 2007).

Amuedo-Dorantes et al. (2007) also mentioned that about 46% of migrants from Mexico send remittances home to cover health expenses while 30% remit to take care of food and maintenance, with 6% using their remittances for debt payments.

Lopez-Cordova and Olmedo (2006) found that as much as 11% of remittances that were sent to households in Guatemala were saved by these households, and close to 7% of remittances sent to households in Brazil were used in the acquisition of property.

Remittance receiving households have higher expenditures on health care than non-receiving households (Kapri & Jha, 2020). Other social impact of remittances on households is the impact of remittance on education in origin countries. De Haas (2006) found that remittances positively added value to local human capital and increased higher school enrollment while Ratha (2013) found a strong and positive correlation between average number of household members with secondary education and receipt of remittances across six sub-Saharan African countries. The relationship between remittances and education expenditure was explained by Mara et al. (2012) and suggests that remittances could reduce liquidity constraints of households thereby enabling them to increase expenditure on education.

Many researchers have found a significant relationship between remittances and household income on consumption. At the household level, remittances increase income and consumption smoothing (Kannan & Hari, 2002); it improves access to better nutrition (Yang, 2003) and to better education (Edward & Ureta, 2001). Stark (1991) concluded that remittances enable rural households to invest locally in riskier activities including self-employment while Adams and Page (2005), Acosta et al. (2008) and World Bank (2008) contended that remittances from migrants' positively influence a country's balance of payments and enhances economic growth. These studies stress how remittances affect household savings and investments in human and physical capital which indirectly affects consumption.

The general findings from existing studies are that remittances have a positive and significant effect on household welfare (see Adams & Page, 2005; Quartey, 2006; Nwaru et al., 2011; Andersson, 2014; Amuedo-Dorantes & Pozo, 2014; Wadood & Hossain, 2017; Keho, 2017; Ahmed, 2020). For example, Adams and Page (2005) in a study from 71 developing countries, found that remittances reduce the share of people living in poverty.

The relevant literature on remittances and welfare studies have focused on the impacts of remittances at the average welfare levels of households with little information on the method and techniques for assessing the distributional impact of remittances on welfare of households.

Most of studies on remittances and welfare nexus estimate the mean effect of remittance on welfare with the implicit assumption that the effect of remittances along the distribution of household consumption is the same (Keho, 2017). Bang et al. (2016) noted that estimation methods and techniques for assessing the distributional impact of remittance on welfare of households can assess the impact of remittances on poverty and inequality simultaneously.

Keho (2017) studied the effect of remittances on household consumption in African and Asian countries using a quantile regression approach which allows for the assessment of the distributional impact of remittances on welfare. However, Keho (2017) failed to address endogeneity of remittances in their estimation.

A household that depends on agriculture as the main economic activity is exposed to several shocks, including price shocks, general ill-health, threats of natural disasters, and crop failure, among others (Teele et al., 2009). Because most of these households do not have diversified sources of income, the severity of these shocks tends to cause much instability in the household, with most unable to meet basic demands like consumption. In these circumstances, the family and community play an important role in protecting them against these risks (Udry, 1994). However, issues such as a lack of functioning financial markets in their jurisdiction, lack of insurance markets, and low or sometimes non-existent household savings, can exacerbate the effect of even small income shocks on the welfare of the household (Teele et al., 2009).

The available literature on the impact of remittances on welfare provide limited information on the impacts of remittances on household welfare in The Gambia. This study will, therefore, contribute to the body of literature that speaks to the impacts of remittances on welfare.

In addition, this study also used the instrumental variable quantile regression approach, which allows for assessing of the distributional impact of remittances on welfare, which previous studies have not accounted for in the remittance welfare nexus.

Table 4.2: Summary of Empirical studies on impact of remittances on household welfare

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
De Haas (2006)	Morocco	Contingency table analysis	Variables: <i>Wealth, living conditions and daily consumption.</i>	Remittances have significantly contributed to economic development and improved standards of living.
Quartey (2006)	Ghana	Random-effects GLS regression model	Dependent: <i>Per capita household consumption</i> Explanatory: <i>Remittance, Volatility index for food price, Age of household head, Size of household, Gender of household head, Education of household head, Household asset, location.</i>	Remittances improve household welfare and help to minimize the effects of economic shocks to household welfare.
Yang and Choi (2007)	Philippine	Two Stage Instrumental Variable estimation	Dependent: <i>household expenditure</i> Explanatory: <i>remittance, household head education, household head occupation, location, climatic shocks.</i>	Total expenditures are higher in-migrant households than in non-migrant house.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
Amuedo-Dorantes et al. (2007)	Mexico	Instrumental variable technique	Dependent: <i>healthcare expenditure</i> Explanatory: <i>remittance, sex of household head, household size, number of dependents, location, insurance coverage.</i>	Remittance income raises households' primary health expenditures.
Acosta et al. (2008)	59 industrial and developing countries	GMM estimator	Dependent: <i>per capita income</i> Explanatory: <i>Female education, Male education, Price of capital, Remittances</i>	Remittances have negative inequality and poverty reducing effects.
Raihan et al. (2009)	Bangladesh	Computable general equilibrium (CGE) model	Dependent: <i>household expenditure</i> Explanatory: <i>household size, education of household head, age of household head, marital status, employment status, dependency ratio, remittance, location.</i>	Remittances had positive and significant impacts on the households' food and housing-related expenditures.
Clément (2011)	Tajikistan	Propensity Score Matching	Dependent: <i>consumption expenditure</i> Explanatory: <i>education of household head, age of household head, marital</i>	Remittances provide short-term coping strategies that help

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>status, sex of household head, household size, dependency ratio, remittance, location</i>	dependent households achieve a basic level of consumption.
Nwaru et al. (2011)	Nigeria	Ordinary least squares	Dependent: <i>per capita household expenditure</i> Explanatory: <i>age of household head, years of education of the household head; total household land holdings, sex of household head, household size, composition of household workforce, total household income, remittance, primary sector of employment</i>	Remittance receiving households have higher welfare status than their non remittance receiving counterparts.
Andersson (2014)	Ethiopia	Propensity Score Matching	Dependent: <i>asset index</i> Explanatory: <i>remittances, Number of members in working age, Female to male ratio, Household size, Head's occupation, Community controls</i>	Remittances have positive effects on consumer asset accumulation, especially in rural areas, but no effect on productive assets.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
Amuedo-Dorantes and Pozo (2014)	Mexico	Instrumental variable approach	Dependent: <i>asset accumulation</i> Explanatory: <i>remittance, household size, household composition, household educational, attainment and employment, household location</i>	Remittance inflows raise asset accumulation among remittance-receiving households.
Munyegera and Matsumoto (2016)	Uganda	Instrumental variable and Propensity Score Matching	Dependent: <i>per capita consumption</i> Explanatory: <i>remittance, mobile phone ownership, value of asset, distance to nearest mobile money agent, education of household head, age of household head, sex of household head, household size.</i>	Remittance receiving households had higher welfare than non-remittance receiving households.
Bang et al. (2016)	Kenya	Instrumental variable quantile regression	Dependent: <i>per capita expenditure</i> Explanatory: <i>remittance, age of household head, education of household head, household size, gender of household head, location, occupation.</i>	Remittances increase household expenditure at all levels of the expenditure distribution.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
Wadood and Hossain (2017)	Bangladesh	Propensity Score Matching	Dependent: <i>consumption expenditure</i> Explanatory: <i>Household Head's sex, Household Head's age, Household Head's education level, Household Head's occupation, No. of household members, Access to electricity, Access to mobile, Land size, Source of Drinking Water, Wall, Material, Sanitation type, location</i>	Remittances have a positive and statistically significant impact on consumption expenditure
Keho (2017)	Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Kenya, Mali, Niger, Nigeria, Senegal, South Africa, Benin, Bangladesh, China, India,	Quantile regression approach	Dependent: <i>consumption per capita</i> Explanatory: <i>real GDP per capita, financial development indicator, remittances as a share of GDP, trade openness</i>	Remittances significantly increase household consumption and the effect is larger at lower levels of consumption.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
	Indonesia, Malaysia, Pakistan, Philippines, Thailand			
Cuong and Linh (2018)	Vietnam	Fixed effects regression	Dependent: <i>consumption expenditure</i> Explanatory: <i>remittance, number of migrants, household size, sex of household head, age of household head, years of education of household head</i>	International remittances help receiving households increase per capita expenditure and reduce poverty.
Kapri and Jha (2020)	Nepal		Dependent: <i>health care expenditure</i> Explanatory: <i>Remittance, Number of migrants, Chronic illness, Sickness injured, Per capita income, Distance to the nearest facility, household size, location, household head sex, household head age, household head</i>	A positive and significant effect of remittances on health care expenditure.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>education, household head occupation, and household head marital status.</i>	
Ahmed (2020)	Bangladesh	Propensity Score Matching	Dependent: <i>asset index</i> Explanatory: <i>Age of the migrant, Years of education, Gender of the migrant, Duration of migration, Number of migrants, Gender of the household head, Age of the head, Marital status of household head, Head's years of education, Location of the Household, Religion of the household, Current earning status of household head, Household size, Ratio of working-age member</i>	Households with a migrant member have a significantly higher asset score compared to the households without a migrant member.
Adebayo et al., 2021	Nigeria	Propensity Score Matching	Dependent: <i>per capita expenditure</i> Explanatory: <i>remittances, household size, sex of household head, age of</i>	Remittance had a positive impact on household welfare in all cases considered.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>household head, marital status, education of household head, occupation, ethnicity, location.</i>	

4.4 METHODOLOGY

4.4.1 The data

This paper uses the latest World Bank Living Standard Measurement Study dataset for The Gambia – The Gambia’s Third Integrated Household Survey (IHS) 2015 which is the most representative available. The IHS is a multi-purpose survey of households designed by the World Bank in partnership with The Gambian Bureau of Statistics and collects information on different dimensions of living conditions of households in the country and used a multi-stage sampling design to sample the respondent households.

The data sets used in this study sampled 13 281 households. The Gambia is divided into eight local government areas, and in this study, we concentrated on farming households for analysis. However, due to low sample observations in some areas, particularly Kanifing Local Government Area and Banjul Local Government Area, where farming activity is less, these areas were dropped, leaving six local government areas and a final sample of 9 954 households for the analysis. The study uses per capita consumption expenditure as an indicator of welfare. As noted by Deaton (1997), consumption is conventionally viewed as the preferred welfare indicator, for practical reasons of reliability and because consumption is thought to better capture long-run welfare levels than current income.

4.4.2 The empirical estimations

To assess the effects of remittances on household welfare we specified and estimated the following empirical model:

$$\begin{aligned} LnC_i = & \delta_0 + \delta_1 Age_i + \delta_2 Sex_i + \delta_3 Educ_i + \delta_4 HHSize_i + \delta_5 Remittance_i + \\ & \delta_6 Farmsize_i + \delta_7 DepR_i + \delta_8 Location_i + \mu_i \end{aligned} \quad (4.1)$$

where LnC_i is the welfare indicator of the i -th household measured as natural log per capita consumption of the household.

Equation (4.1) assumes the marginal effect of remittances on welfare to be the same irrespective of the level of household welfare (Keho, 2017). If the effects of remittances differ with different levels of household welfare, then the linear relationship may be misspecified. Quantile regressions allow for the estimation of the effects of covariates at different points of the distribution of the dependent variable (Keho, 2017). In the context of this study, quantile regression allows to assess the impacts of remittances across the distribution of household welfare levels.

Koenker and Bassett (1978) introduced the quantile regression method, which according to Keho (2017), is less sensitive to outlier observations and provides more efficient estimators when the error term is non-normal. The quantile regression model can be expressed as:

$$Q(LnC_i) = \delta_0 + \delta_1 Age_i + \delta_2 Sex_i + \delta_3 Educ_i + \delta_4 HHSize_i + \delta_5 Remittance_i + \delta_6 Farmsize_i + \delta_7 DepR_i + \delta_8 Location_i + \mu_i \quad (4.2)$$

where $Q(LnC_i)$ is the conditional quantile of the household welfare. The reduced form of equation (4.2) is expressed as:

$$y_i = x_i \delta_\tau + \varepsilon_i \quad (4.3)$$

where x_i is a vector of explanatory variables, δ_τ are $n \times 1$ estimation parameters at the τ -th quantile of the dependent variable. The quantile regression estimator minimises an asymmetrically weighted sum of absolute errors:

$$\min_{\delta} \sum_{i=1}^T \rho_\tau(y_i - x_i \delta_\tau) \quad (4.4)$$

where $\rho_\tau(z)$ is the check function defined as $\rho_\tau(z) = z(\tau - I_{(z < 0)})$, $0 < \tau < 1$. The expression $I(\cdot)$ denotes the indicator function.

Remittances are endogenous as they are a function of household characteristics and migration. The receipt of remittances by households in the study sample is not randomly selected; hence the problem of selection bias arises in the estimation procedure. When

endogeneity and selection bias is not corrected, the parameter estimates will not be consistent. The study used the instrumental variable quantile regression (IVQR) technique proposed by Chernozhukov and Hansen (2005) to account for possible endogeneity in the model.

In identifying appropriate instruments to correct estimation biases, the study proposes using two instruments in the model to control for endogeneity: distance to post office and migrant network. Remittances are sent through money transfer operators who mostly partner with banks and post offices. Post offices are more widespread than banks in rural The Gambia. Therefore, a post office facility in a community makes remittance transactions easier. Meanwhile, the presence of a post office does not necessarily directly affect household welfare. The second instrument is the migrant network, defined as the district average of migrants, excluding the number of migrants of an observed household.

To test for endogeneity, the strength and validity of the instruments used, the study first estimated an instrumental variable 2-staged least square model. The test for endogeneity was conducted using the Wu-Hausman test for endogeneity in STATA. The results of the Wu-Hausman test rejected the null hypothesis that remittance is an exogenous variable; hence justifying the use of the Instrumental Variable Quantile Regression model.

Next, the study used the test for overidentification to test whether the structural equation was well specified. The overidentifying restrictions test of Sargan χ^2 and Basman χ^2 had large p-values, indicating that the structural equations are well-specified as well as the fitness of the model. However, the minimum eigenvalue statistic is less than the “LIML size of nominal 5% Wald test” at 15%, 20% and 25%, respectively, indicating that the instruments used are relatively weak. Refer to Appendix 5D for the test results for the instrument’s validity.

4.4.3 Description of variables

The study used several explanatory variables in the estimated model. The definitions and units of measurement of these variables are described in Table 4.3: Variable description below. The dependent variable is the welfare of households measured as per capita consumption expenditure within the study sample.

The life-cycle hypothesis postulates that household demographic variables affect welfare levels. The study, therefore, includes household demographic variables such as the age of household head, sex of household head, household size and dependency ratio.

The empirical relationship between the age of the household head and household welfare is not conclusive in the literature. For instance, Adebayo et al. (2021) found a positive relationship between the age of the household head and welfare, while Quartey (2006) found the age of the household head to be negatively correlated with household welfare. The age of the household head is used to represent the experience of the household head, as generally, older persons are assumed to be more experienced than younger people with similar exposure. The *a priori* expectation for the effect of age of household head on household welfare estimation is, therefore, positive or negative.

Female-headed households were generally poorer than male-headed households because women in sub-Saharan Africa own less property than men (Cagatay, 1998). However, if the female is the head of the household because the male has migrated, then depending on the volume of remittances received, the relationship between female-headed households and household welfare may be positive.

The household size is expected to be inversely related to the household's welfare. The larger the household size, the more it is likely to spend on consumption. Quartey (2006) and Adebayo et al. (2021) found a negative relationship between household size and the welfare of households. Related to household size is the dependency ratio. A household with a higher share of dependents is likely to have a high propensity to consume, thereby lowering per capita consumption given a fixed income.

It is expected that the higher the number of years of formal education, the higher the amount of non-farm income, leading to higher household income. Educational attainments increase human capital and are, therefore, considered a tool for poverty alleviation and welfare improvement (Adebayo et al., 2021). Households with high incomes are expected to consume more than households with lower incomes. The NELM suggests that adult household members participate in the decision-making process

concerning migration-related activities of the household. The educated members of the household are assumed to have more knowledge about job opportunities abroad and are, therefore, able to make better decisions for the family.

Table 4.3: Variable description

Variable	Variable description
<u>Dependent variable</u>	
Household welfare	Per capita consumption expenditure of households in The Gambian Dalasi
<u>Independent variables</u>	
Remittances	Receipt of any type of remittance. Dummy variable, Remittance recipient =1, otherwise =0
Sex	Sex of the household head. Dummy variable, Male =1, otherwise =0
Age	Number of complete years of the head of the household
Household size ³	Number of people who live together in the same housing unit
Years of education	Total number of years of formal education of the household head
Rural/urban location	Nature of the dwelling community of a household. Dummy variable, Urban =1, otherwise =0
Farm size	Total area of farm measured in acres
Dependency ratio	Ratio of the number of dependent members of a household (aged less than 15 and equal to or above 65) to the number of working age household members (aged 15 to 64).

The study includes farm-level characteristics such as farm size in the model. The size of a farm is expected to be positively correlated with farm production. With higher farm production, households are expected to receive more sales from farm outputs, leading to

³ The household size is the number of people who live together in the same housing unit, who acknowledge one person as the head of the household, share the same housekeeping and cooking arrangements.

increased household income. Households with high incomes are expected to consume more than households with less income. Therefore, the *a priori* expectation is positive.

A remittance is the transfer of money by a non-household member to a receiving household. Remittance is measured as a dummy to reduce the measurement error usually associated with households unable to precisely recall the number of remittances received over the survey reference period. The location of a household can affect household welfare. For example, rural areas generally have high transportation costs due to poor roads, while urban areas have higher food prices. There are also differences in expenditure priorities in rural and urban households.

4.4.4 Descriptive statistics of the sampled households

Table 4.4 presents the descriptive statistics of the variables used in the analysis. The sample's mean remittance amount received by households is 3 323 906 dalasi. About 41.43% of the sampled households have access to remittances, representing a fair proportion of the sampled households with access to remittances. Out of households that had access to remittances, about 15% had access to only domestic remittances, about 23% had access to only international remittances, and about 3.5% had access to both domestic and international remittances.

The average household annual expenditure within the sample is estimated at 133 359.40 dalasi. This is more than the World Bank's estimated Gross National Income (GNI) per capita for The Gambia in 2015, which was 85 244 dalasi. The variation between the sample annual per capita expenditure and GNI could be explained by the high access to remittance by the sampled households. The average age of the household head in the sample is estimated at 49 years, with an average of nine years of schooling.

Table 4.4: Descriptive statistics of variables used

Variable	Mean	Std. Dev.	Min	Max
Remittances	3,323,906	83,200,000	0	3,000,000,000
Household expenditure	133,359.40	1,193,531	2884	116,000,000.00
Age	49.23	14.32	16	98
Household size	8.83	5.46	1	82
Years of education	9.01	3.99	0	22
Farm size (acre)	12.25	24.58	0	999.28
Dependency ratio	1.25	0.85	0	9

Source: Author's computation based on The Gambia Third Integrated Household Survey (IHS) 2015

Table 4.5: Distribution of sex and location of households

Variable	Frequency	Percentage
Male household head	8,653	86.93
Female household head	1,301	13.07
Rural households	9,108	91.50
Urban households	846	8.50

Source: Author's computation based on The Gambia third Integrated Household Survey (IHS) 2015

Table 4.6: Source of remittances received by the sampled household

Source	Frequency	%
No remittance	5,830	58.57
Domestic remittance	1,502	15.09
Domestic and international	354	3.56
International remittance	2,268	22.78
Total	9,954	100.00

Source: Author's computation based on The Gambia third Integrated Household Survey (IHS) 2015

Table 4.7: Relationship between household head and remitter

Relationship	Frequency	Percent
Parent	199	2.42
Spouse	481	5.84
Child	2,746	33.36
Brother/sister	2,754	33.46
Other relative	1,379	16.75
Non-relative	672	8.16
Total	8,231	100.00

Source: Author's computation based on The Gambia third Integrated Household Survey (IHS) 2015

4.5 RESULTS AND DISCUSSION

The results of the instrumental variable quantile regression model are presented in Table 4.8 for selected quantiles (0.1, 0.25, 0.5, 0.75 and 0.9). The study also presents the results from ordinary least square (OLS) estimation in the first column of Table 4.8. From the results, the age of the household head, sex of the household head and farm size did not significantly affect the level of household consumption expenditure in The Gambia. The remaining results confirmed the *a priori* expectations: household heads with more years of education spend more than those with less education, urban households spend more than rural households, while per capita consumption is less in large household sizes and has a higher dependency ratio.

The empirical relationship between the education levels of household heads was consistent with the literature on welfare studies (see Agwu et al., 2018; Adebayo et al., 2021). Generally, household heads with higher education can have an off-farm employment opportunity to generate more income for the household. The results showed that years of education increased with household welfare at all the per capita expenditure distribution quantiles.

However, the effect of education on welfare was not evenly distributed at all the quantiles. The household head's years of education had the strongest impact on household welfare at the 90th percentile. The results show that an additional year of education for the household head at the 90th quantile of income distribution increased household

welfare by 2.18%. Given that the adult literacy rate for The Gambia is 50.8%, this study's results imply that households' welfare levels could be improved with increased access to secondary education in the country.

Table 4.8: Regression results by selected quantiles

Explanatory variables	OLS	Instrumental variable quantile regression				
		0.1	0.25	0.5	0.75	0.9
Age	0.0012 (0.0012)	0.0023 (0.0015)	0.0019 (0.0013)	0.0014 (0.0012)	0.0009 (0.0015)	0.0004 (0.0019)
Gender ¹	-0.0800 (0.0523)	-0.0546 (0.0672)	-0.0617 (0.0550)	-0.0696 (0.0528)	-0.0776 (0.0645)	-0.0859 (0.0852)
Education	0.0169*** (0.0034)	0.0107** (0.0047)	0.0131*** (0.0039)	0.0159*** (0.0034)	0.0188*** (0.0036)	0.0218*** (0.0045)
Farm size	0.0002 (0.0006)	0.0004 (0.0005)	0.0002 (0.0005)	0.0001 (0.0005)	-0.0001 (0.0007)	-0.0003 (0.0009)
Household size	-0.0624*** (0.0032)	-0.0631*** (0.0061)	-0.0629*** (0.0050)	-0.0628*** (0.0040)	-0.0626*** (0.0032)	-0.0624*** (0.0030)
All remittances ¹	0.1190*** (0.0273)	0.1012** (0.0356)	0.1127*** (0.0291)	0.1257*** (0.0275)	0.1395*** (0.0329)	0.1537*** (0.0432)
Domestic remittance ¹²	-0.0645* (0.0379)	0.0576 (0.0479)	0.0285 (0.0394)	-0.0037 (0.0388)	-0.0345 (0.0478)	-0.0623 (0.0612)
International remittance ¹²	0.2315*** (0.0329)	0.1976*** (0.0431)	0.2158*** (0.0349)	0.2348*** (0.0333)	0.2561*** (0.0405)	0.2769*** (0.0528)
Rural/urban ¹	0.4111*** (0.0388)	0.4353*** (0.0498)	0.4249*** (0.0406)	0.4133*** (0.0387)	0.4013*** (0.0470)	0.3893*** (0.0621)
Dependency ratio	-0.1073*** (0.0170)	-0.0646*** (0.0224)	-0.0823*** (0.0186)	-0.1022*** (0.0162)	-0.1229*** (0.0166)	-0.1441*** (0.0198)
Constant	10.0459*** (0.0724)	9.3532*** (0.1038)	9.6626*** (0.0839)	10.0088*** (0.0726)	10.3694*** (0.0791)	10.7383*** (0.1021)

Note: ***, ** and * indicate 1%, 5% and 10% significance levels respectively. Robust standard errors in parentheses

¹ The estimated coefficients have been transformed by $(exp^{\delta} - 1) * 100$.

² The model was estimated on separate sub-sample. Only results is included in the table.

Household size and dependency ratio had similar effects on household welfare. Larger household size and high dependency ratio reduced household welfare at all the quantiles within the sample. The effects of household size on household welfare were even at all quantiles. From the results, an increase in household size by 1, reduced household welfare by approximately 6% at all quantiles. The results are consistent with previous results in the literature. For example, Quartey (2006) and Adebayo et al. (2021) found a negative relationship between household size and the welfare of households.

The effect of remittances on household welfare is statistically significant at all levels of the quantile distribution, but the effect is not uniformly distributed across income levels.

From the results, households at the 10th quantile of income distribution who received remittances had their welfare increase 10.12% more than similar households that did not receive remittances. The effect of remittances on household welfare increased with the conditionally higher quantiles. At the 90th quantile, households that received remittances had a welfare increase of about 15.37% more than similar households that did not receive remittances.

This means that, on average, rich households stand to benefit more from remittances than poor households. The result is consistent with the theory of consumption, remittances received by household's form part of household's income and therefore relaxes budget constraints faced by the household to consume more. It is also in line with extensions of the NELM and permanent income hypotheses which show the ability to smoothen consumption and mitigate the effect of shocks.

A further decomposition of the effect of remittances by the type of remittance (domestic or international) received revealed that, the positive effect of remittances on household welfare was mainly driven by international remittances. While the effect of international remittances was positive on all households, households that received only domestic remittances had less welfare than other households. The result resonates with Bang et al. (2016), who found that remittances have greater benefits for rich households in Kenya.

Even though remittances have a higher welfare impact on higher-income households, the impact of a 10.12% increase in the welfare of low-income households is substantial. This also suggests the possibility that remittances can be an enabling channel for low-income households to migrate to middle-income status. Similar findings were made by Acosta et al. (2008), Cuong and Linh (2018), Bang et al. (2016) and, Wadood and Hossain (2017), who also showed that remittances help receiving households increase per capita income and reduce poverty.

The estimated results were robust to many controls during estimations. We also controlled for the possibility of further heterogeneity due to the location by interacting remittances with the geographical location of households. However, the coefficients of the interactive term, though statistically significant at a 5% significance level, were very small and of little economic value.

4.6 CONCLUSION AND POLICY RECOMMENDATIONS

The study used an instrumental variable quantile regression approach to assess the relationship between remittances and household welfare in The Gambia using The Gambia's Third Integrated Household Survey (IHS) 2015.

After instrumenting for the endogenous variable, remittance in the model and controlling for household demographic characteristics, the study finds that the effects of remittance on household welfare are significant and not uniform across the quantiles as richer households receiving remittances have greater welfare impacts than poorer households receiving remittances.

The results are consistent with the a priori expectations of the study and confirm the results of similar literature studies. This study provides further evidence to the literature for households in The Gambia.

Over the past decade, remittance flow to The Gambia has increased by almost 139%, and the study results find that remittances improve household welfare. On average, the cost of remittances to The Gambia is about 8.8% of the face value amount. This transaction cost is more than the West African average of 6.1%.

Based on the findings of this study, for households to benefit more from remittances, the government should put measures in place to reduce the transaction costs of receiving remittances in The Gambia. Some measures could include reducing taxes on money transfer services in the country. The cost saving from such a reduction in transfer charges can substantially benefit poorer households who receive remittances. In addition, efforts should be made to promote financial inclusion to bring remittance recipient households into the formal financial sector for longer-term impacts.

While the study sheds light on the uneven distribution of benefits of remittance at all levels of the quantile distribution, additional research is required to confirm if the uneven distribution of benefits of remittances is increasing income inequality in The Gambia.

APPENDICES**Appendix 4A: Two stage least square estimation**

Explanatory variables	Coef.	Std. err.	Prob.
Remittance	5.1435	2.5692	0.045
Age	0.0220	0.0170	0.196
Age squared	-0.0002	0.0002	0.252
Gender	3.8223	1.9929	0.055
Education	0.0104	0.0061	0.089
Household size	-0.0572	0.0052	0.000
Dependency ratio	-0.1536	0.0344	0.000
Farm size	0.0010	0.0012	0.430
Rural/Urban	0.5114	0.1066	0.000
Remittance*rural	0.3523	0.1926	0.067
Remittance*female	4.9625	2.5319	0.050
Remittance*farmsize	-0.0023	0.0023	0.307
Constant	5.6909	2.2984	0.013
No of Observations		1,662	
Wald chi2(12)		333.67	
Prob > chi2		0.0000	

Appendix 4B: First stage regression test

Minimum eigenvalue statistic = 3.55993	Critical Values			
	5%	10%	20%	30%
2SLS Size of nominal 5% Wald test	19.93	11.59	8.75	7.25
LIML Size of nominal 5% Wald test	8.68	5.33	4.42	3.92
R-square:	0.9484			
Adj. R-square	0.9480			
Partial R-square	0.0043			
Prob > F	0.0287			
F (2,1648)	3.55993			

Appendix 4C: Test of endogeneity

Durbin (score) chi2(1)	7.93477	(P = 0.0048)
Wu-Hausman F (1,1648)	7.90568	(P = 0.0050)

Appendix 4D: Tests of overidentifying restrictions

Sargan (score) chi2(1)	2.45054	(P = 0.1175)
Basman chi2(1)	2.43348	(P = 0.1188)

CHAPTER 5: DO AGRICULTURAL HOUSEHOLDS USE REMITTANCES TO REDUCE VULNERABILITY TO EXPECTED POVERTY?⁴

5.1 INTRODUCTION

Poor households are among the vulnerable groups in society (World Bank, 2001). Existing literature suggests that remittances can help alleviate poverty in developing countries through income and consumption smoothing, and asset accumulation (Adams, 1998; Jones, 1998; Adams & Page, 2005; Amuedo-Dorantes & Pozo, 2014). Households receiving remittances generally have higher spending and lower incidences of poverty than households that do not receive remittances. In addition, remittances tend to increase the disposable income of receiving households.

Christiaensen and Hill (2019) noted that poverty in Africa is both a chronic and transitory situation. Poverty is a static social condition of households. However, households are dynamic and can get out, remain, or fall into poverty depending on several factors. The latter two situations; “remaining poor” and “falling into poverty” are primarily due to structural conditions such as lack of assets, limited access to public goods and services, and lack of income-earning opportunities (Christiaensen & Hill, 2019).

Remittance flow to a household could relax the “lack of income-earning opportunities” constraint facing a household. Once the “lack of income-earning opportunities” is relaxed, a household can escape poverty. In addition, remittances may help households to smooth consumption by providing insurance against future income shocks. When remittance serves as household insurance, households could avoid falling into poverty and thus reduce their vulnerability to expected poverty. Insurance removes the risk of worsening poverty or poverty traps (Dercon, 2001).

Although remittance affects poverty and vulnerability to poverty through similar channels of asset accumulation, consumption smoothing, investment and risk mitigation,

⁴ This paper has benefited from comments and suggestions from participants at the 10th Africa Business and Entrepreneurship Research Society (ABERS), Québec. May 18-21, 2022, at Université Laval’s Faculty of Business Administration.

available evidence largely focuses on remittances and poverty, but little is known about remittances and vulnerability. Vulnerability to poverty and poverty are different concepts but closely linked. Whilst poverty measures the current welfare state of a household or individual, vulnerability to poverty is a more forward-looking concept of the state of welfare. For example, a household may not be poor today but end up poor tomorrow; such a household is vulnerable to poverty. Similarly, a poor household today may fall into deeper poverty tomorrow and is also vulnerable.

The poverty rate in sub-Saharan Africa has reduced from 55.7% in 1990 to 40.2% in 2018; meanwhile, the number of poor people has increased from 283.8 million in 1990 to 433.4 million in 2018 due to a population growth rate of about 2.7% (World Bank, 2022). Four out of five of the poor live in rural areas and are predominantly into farming (Christiaensen & Hill, 2019). Even though remittances can reduce poverty, there is no strong conclusion on the effects of remittances on vulnerability to expected poverty. Since remittances can serve as insurance to households, and agricultural households are generally poor and do not have access to credit and insurance products, there is an important question whether remittance help to reduce vulnerability to expected poverty of agricultural households.

Low-income households, including agricultural households, especially those in developing countries, are characterised by very small farm sizes, large household sizes and small incomes. Moreover, most agricultural households' practice of rain-fed agriculture makes them very vulnerable to many shocks (Baiyegunhi & Fraser, 2010) for example drought and floods, worsening the future well-being of such households.

While studies on vulnerability in Africa have focused mainly on the general population, farming households at risk to income fluctuations have not been studied in depth (Adams & Page, 2005; Adams & Cuecuecha, 2010; Bogale, 2012; McCarthy et al., 2016). A few studies, such as Oni and Yusuf (2008) and Bogale (2012), studied the determinants of vulnerability in rural households. However, these studies did not explore the effects of remittances on vulnerability. Several studies have also examined the food security situations of farming and rural households (Bogale, 2012).

It must be noted that food security status is a static measure; therefore, a household may be food secured in time T; however, the same household can be food insecure in time

T+1. The dynamic behaviour of household can be better understood by assessing the vulnerability to the future consumption of households. The study helps to fill this knowledge gap in the literature.

This paper examines the factors that affect agricultural households' vulnerability to expected poverty by adapting the vulnerability-as-expected-poverty (VEP) approach (Chaudhuri et al., 2002). This approach has widely been used to analyse vulnerability to poverty (Günther & Harttgen, 2009; Kruy et al., 2010; Bogale, 2012).

This paper contributes to literature by assessing the effects of remittances on the vulnerability to expected poverty of agricultural households, to provide better understanding of the dynamic behaviour of households' consumption in the future. The dynamic behaviour of households' consumption in the future can be better understood by assessing the vulnerability to future consumption of households.

This study uses household-level data from The Gambia, Ghana and Nigeria to assess the impacts of remittances on household vulnerability to expected poverty. The remittance flows to these countries have increased significantly in the recent decade providing a steady income for many households.

The Gambia is a relatively small country with high poverty rates and high per capita remittance, while Ghana has a fast-growing economy and has received relatively high remittances with reducing poverty trends over the last decades. Nigeria has the largest economy in Africa, with high remittance and poverty. As noted in Chapter 1, all three countries are largely agrarian, as the agricultural sector employs more than 50% of the labour force and contributes to over 20% of GDP.

The remaining sections of the paper are organised as follows: Section 5.2 and 5.3 present the literature review and methodology for analysing the research problem and Section 5.4 presents the results and discussions of the study. The final section presents the conclusion and policy recommendations emerging from the study.

5.2 LITERATURE REVIEW

5.2.1 Theoretical literature

The life cycle and permanent income hypotheses are major theories that lay down the foundations of consumption behavior of individuals and households.

The life cycle theory of consumption was developed by Franco Modigliani and Richard Brumberg in 1954 which stipulates that people seek to maintain the similar level of consumption throughout their lifetime by borrowing or liquidating assets at early and late stages of life when income is low, and saving when income is high (Modigliani & Brumberg, 1954). The theory argues that maximization of personal utility is derived through the allocation of current and future income to a lifelong consumption pattern (Modigliani & Brumberg, 1954; Ando & Modigliani, 1963). Reilly and Norton (1999) notes that an individuals' income and consumption expenditure follow a three-stage pattern: accumulation stage, consolidation stage and spending stage.

Deaton (2005) notes that the theory is consistent with consumer choice theory and offers fundamental principles on a wide range of issues about consumption and savings. Accordingly, lifetime consumption is proportional to lifetime income. Remittances received by households at any time form part of household income and therefore part of the lifetime income of the household. Hence remittances should have a direct relationship with future consumption, which is the focus of this study.

Milton Friedman developed the permanent income hypothesis in 1957 (Friedman, 1957). The theory stipulates that all things being equal, an individual does not allow consumption to swing with income fluctuations in the short run. The theory implies that changes in consumption pattern of individuals are driven by future income which has implications for studies on remittances and vulnerability of households because remittances provide lifetime income guarantees for receiving households. In future periods of shocks, the implication of the theory is that consumption of households receiving remittances could be stable and thereby reduces their vulnerability to poverty.

Remittances provide recipient households with income for expenditure. To fully understand the relationship between remittances and household expenditure, it is important to establish the motivations for the remittance. As stated under section 2.1, the motivations for sending remittances can be grouped into two strands: the endogenous and portfolio approach. When households receive remittances from family and friends, these remittances could be used for investment or spent on general household expenditure. The theoretical framework that underpins the effect of remittance on household expenditure can be examined through the household expenditure model (Kapri & Jha, 2020). Under the basic household expenditure model, a household has two-stage decision making process: in the first stage, the decision for a member of the household to migrate is made and the second stage involves the decision to spend remittances received from migrant family member to maximize household total utility.

5.2.2 Empirical literature review

The literature established that households receiving remittances generally had higher spending and lower incidences of poverty than households that did not receive remittances, suggesting that remittances tended to increase the disposable income of receiving households.

Migrants' remittances could provide social insurance for members of receiving households. When remittances were sent home, in times of shocks, the household could rely on the remittances received to mitigate the adverse impact of the shocks on the household. Bryceson and Ulla Vuorela (2002) and Levitt and Lamba-Nieves (2011) argued that migrants often sent remittances home as a form of social insurance for the family.

Most agricultural households in developing economies are characterised by substantial fluctuations in income. There are however many needs to be met, including various consumption demands as well as those related to business expansion. From the view of Attanasio and Rios-Rull (2000), income fluctuations do not necessarily have to translate into fluctuations in consumption. Accordingly, all risk should be diversified away so that personal or transitory shocks should have no impact on consumption levels (Murdoch, 1995).

This is however not the case in most developing economies, especially for poor and agricultural households. Indeed, most economies where agriculture is the main economic activity have undeveloped financial markets to shield such households in times of shocks (Attanasio & Rios-Rull 2000). The lack of developed and well-functioning financial markets capable of meeting the various needs of these households prevents agricultural households from borrowing and lending, and from insuring both among themselves and with the outside world. Those who are fortunate enough to have relatives remit them stand a higher chance of meeting these goals especially to smoothen their consumption while meeting their business demands.

The impact of remittances on poverty reduction has been widely studied in the developing world with Asia having the greatest number of studies due to the huge amount of migrant remittances received in Asia. The literature identifies three main dimensions of poverty: poverty reduction, income inequality and vulnerability to poverty (Adams, 1998; Jones, 1998; Adams & Page, 2005; Amuedo-Dorantes & Pozo, 2014). Bouoiyour and Miftah (2014) allude that the impact of remittances on poverty is an empirical question that may depend on whether remittances are treated as exogenous income.

Even though remittances generally impact positively on poverty reduction, Lubambu (2014) argued that the positive impacts on poverty alleviation are overestimated. He further argued that remittances have the possibility of creating a culture of dependency among receiving households since remittances are sent at regular intervals. This assertion is corroborated by a study in Angola, where a survey revealed that 16% of households depend solely on remittances as household income (Alvarez- Tinajero, 2010). Lubambu (2014) inferred that the dependency of households on remittances might deepen the vulnerabilities of households when there is a major global economic downturn.

Furthermore, remittances were not received in all households in developing countries. Therefore, the poverty alleviation impact of remittances is limited only to households that can overcome migration barriers. Often, the cost and risks associated with migration inhibit the poor or vulnerable households from raising the initial capital required to

finance migration (World Bank, 2011; Kamuleta, 2014). Remittance is usually viewed as private financial flow directly to households.

The literature analysing the impacts of remittance flows show it is beneficial at all levels in reducing poverty and improve welfare, from the individual to the macro level (Quarthey, 2006).

Regarding studies on remittances and income inequality, Adams et al. (2008) found that remittances increased income inequality in Ghana. Bang et al. (2016), who found similar results, explained that poorer households could not finance the migration of household members, thereby not benefitting more from remittances as compared to rich households.

Adams et al. (2008) earlier argued that households receiving remittances are relatively well-off, coupled with increased expenditure that comes with the receipt of remittances, thereby raising income inequality. In contrast, Akobeng (2016) found that remittances reduce income inequality in countries with financial development where stronger credit markets enable households to save remittances or channel them towards productive investments.

Few studies have explored the effects of remittances on household vulnerability to poverty (De la Fuente, 2010; Zereyesus et al., 2016). De la Fuente (2010) examined whether remittances are likely to reach households whose conditions are prone to worsen in the future and found a negative relationship between remittances and rural households' threat to future poverty. However, it did not establish the attribution of remittances to reducing vulnerability to poverty in rural households. Zereyesus et al. (2016) studied the impact of remittances on vulnerability in Bangladesh and found that remittances impacted household welfare by increasing consumption levels and reducing their vulnerability to poverty.

The empirical literature reviewed and discussed establishes the impacts of remittances on poverty. However, there is little evidence on the effects of remittances on vulnerability to poverty in sub-Saharan Africa.

This paper contributes to the literature by assessing the effects of remittances on the vulnerability to expected poverty of agricultural households in order to provide better understanding of the dynamic behaviour of households' consumption in the future.

Table 5.1: Summary of selected empirical studies on impact of remittance on poverty and vulnerability

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
Adams (1998)	Pakistan	Tobit model	Dependent: <i>value of asset</i> Explanatory: <i>remittance, return on capital, labor income, number of children, age of household head.</i>	External remittances are temporary shocks to income that is invested. Internal remittance forms a mixture of permanent and transitory income used for both consumption and investment.
Jones (1998)	Mexico	Correlation analysis	Income inequality, family income, population size, migration stage.	Interfamilial inequalities are found first to decrease and then to increase as migration experience deepens. Remittance improves rural income relative to urban ones.
Adams and Page (2005)	71 developing countries.	Ordinary Least Square, Instrumental variable	Dependent: <i>poverty head count, poverty gap</i> Explanatory: <i>per capita income, remittance, migration.</i>	Remittances significantly reduce the level, depth, and severity of poverty in the developing world.
Quartey (2006)	Ghana	Random-effects GLS regression model	Dependent: <i>Per capita household consumption</i> Explanatory: <i>Remittance, Volatility index for food price, Age of</i>	Remittances help to minimize the effects of economic shocks to household welfare.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>household head, Size of household, Gender of household head, Education of household head, Household asset, location.</i>	
Adams et al. (2008)	Ghana	Two-stage multinomial logit model with instrumental variables	Dependent: <i>poverty</i> Explanatory: <i>Age of household head, Household size, Number of males over age 15, Number of children under age 5, Migration Networks, remittance.</i>	Remittances reduce the level, depth, and severity of poverty in Ghana.
Raihan et al. (2009)	Bangladesh	Logit model	Dependent: <i>poverty status</i> Explanatory: <i>household size, education of household head, age of household head, marital status, employment status, dependency ratio, remittance, location.</i>	The probability of a household becoming poor decreases by 5.9% if the households receive international remittances.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
De la Fuente (2010)	Mexico	Instrumental Maximum Likelihood Estimation Probit model	Dependent: <i>vulnerability to poverty</i> Explanatory: <i>Rainfall distribution, number of cattle, land size, household size, dependency ratio, age of household head, education of household head, employment of household head.</i>	A negative and statistically significant relationship between remittances and the threat to future poverty that rural households could experience.
Levitt and Lamba-Nieves (2011)	Dominican Republic	Qualitative analysis	Migration, remittances, and uses of remittances and benefits of migration	Remittances provide a form of social insurance for the family.
Amuedo-Dorantes and Pozo (2014)	Mexico	Instrumental variable approach	Dependent: <i>asset accumulation</i> Explanatory: <i>remittance, household size, household composition, household educational, attainment and employment, household location</i>	Migrants may be more likely to send money home on a regular basis as a self-insurance mechanism.
Bouoiyour and Miftah (2014)	Morocco	Heckman two step model	Dependent: <i>vulnerability, poverty rate</i> Explanatory: <i>Age in years of household head, Land surface,</i>	Poverty rate and the vulnerability of non-poor households are significantly reduced due to remittances.

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>Number of livestock, Household size, remittance, number of migrants</i>	
Bang et al. (2016)	Kenya	Instrumental variable quantile analysis	Dependent: <i>Expenditures per Capita</i> Explanatory: <i>Household Head's Age, Household Head's Education, Household Size, Household Head's Gender, Location, Occupation, Remittances.</i>	Remittances reduce poverty and improve the distribution of income.
Akobeng (2016)	sub-Saharan African countries (41)	Instrumental Variable (IV) two-stage least squares (2SLS)	Dependent: <i>Poverty rate</i> Explanatory: <i>Remittances, household income, GDP, Democracy, inflation, finance, dependency ratio, trade openness</i>	Remittances reduce poverty and have income equalizing effects.
Zereyesus et al. (2016)	Bangladesh	Three-stage Feasible Generalized Least Square (FGLS)	Dependent: <i>Vulnerability to Food Poverty</i> Explanatory: <i>Remittance, Value of Income, Value of Medical Expense, Value of Crop Loss, Value of</i>	Remittances have the highest impact on households' welfare by providing supplemental income in times of need that boost their consumption levels and

Author(s), Year	Case Study	Model & Estimation Method	Variables Included	Key Finding(s)
			<i>Livestock Loss, Value of Asset Loss, Household Head Age, Household Head Education, Household Head Gender, Home Ownership, Persons per sleeping room, Credit, Crop Yield</i>	therefore reducing their vulnerability to poverty.
Wadood and Hossain (2017)	Bangladesh	Propensity Score Matching	Dependent: upper <i>poverty line</i> (<i>dummy</i>) Explanatory: <i>Household Head's sex, Household Head's age, Household Head's education level, Household Head's occupation, No. of household members, Access to electricity, Access to mobile, Land size, Source of Drinking Water, Wall, Material, Sanitation type, location</i>	Remittances have statistically significant impacts on reducing poverty.

5.3 METHODOLOGY

5.3.1 The data

We used the most recent available household surveys from Nigeria, Ghana and Gambia for our analysis. The data was drawn from the Nigeria General Household Survey Wave 4, the Ghana Living Standard Survey Round 7 (GLSS7) and The Gambia third Integrated Household Survey (IHS) 2015 respectively.

These multi-purpose data sets are the most representative of national household surveys available for this study in the selected countries and collect information on different dimensions of living conditions of households in the selected countries. They contain data on demographic characteristics of the households, consumption expenditure and income levels, remittances received and farm characteristics.

The sample size drawn from these data sets are restricted to on agricultural households. For the purpose of this study, we define agricultural household as a household that has at least one member of the household cultivating a farmland. Table 5.2 shows the distribution of the sample size per country with The Gambia having the highest number of sampled households.

Table 5.2: Distribution of sample size by countries

Country	Sample size	Year of survey
The Gambia	9,960	2016
Nigeria	3,476	2018/2019
Ghana	7,517	2017

5.3.2 Empirical estimations technique

5.3.2.1 Approaches to measuring vulnerability

Various approaches are used to measure economic agents' vulnerability (McCarthy et al., 2016). In all the different approaches, the concept of vulnerability includes the time dimension of risk, for example Hoddinott and Quisumbing (2003) define vulnerability as

the likelihood that at a given time in the future, an individual will have a level of welfare below some norm or benchmark. The likelihood of a household falling below a defined benchmark is a function of its risks and capacity to manage the risk (Dercon, 2001; López-Calva & Ortiz-Juarez, 2014).

The literature on vulnerability identifies two main strands of the approaches to vulnerability (Sarris & Karfakis, 2006). The first strand identifies two main approaches to assessing and estimating vulnerability. The first considers vulnerability as the probability of falling into poverty – “vulnerability to expected poverty” (VEP) (Christaensen & Subbarao, 2005; Chaudhuri et al., 2002), while the second considers vulnerability as a low expected utility (VEU) (Ligon & Schechter, 2002). The other strands of approaches in the literature identify a third that considers vulnerability as the extent to which negative shocks cause a drop in welfare (VER) (Hoddinott & Quisumbing, 2003).

The VER approach assesses the ex-post resilience of a household against shocks (Hoddinott & Quisumbing 2003). This approach is a backwards-looking method to measure a household’s reliance against an occurring shock. However, it can be used to assess how households smoothed their consumption during a period of shock.

To estimate the effects of remittance on expected household consumption, also known as vulnerability of household to consumption, we follow the Vulnerability to Expected Poverty (VEP) approach, where per capita consumption will be used as an indicator of well-being. The VEP approach does not require a household’s risk-aversion information which makes it relatively easy to estimate since true household risk preferences are difficult to estimate (McCarty et al., 2016).

In the absence of panel data, the VEP approach is more robust than other approaches in estimating vulnerability (McCarty et al., 2016). We used the VEP approach proposed by Chaudhuri et al. (2002), Christaensen and Subbaro (2005) and Sarris and Karfakis (2006) to measure vulnerability.

Both observable and unobservable characteristics influence a household’s food consumption expenditure. A stochastic consumption model of a household (*i*) is specified as follows:

$$\ln C_i = \alpha + \beta_i X_i + \varepsilon_i \quad (5.1)$$

Where C_i is the per capita consumption expenditure of household i , X_i is a vector of observable household characteristics, α and β are parameters to be estimated, and ε_i is a zero mean error term of the model with normal distribution containing the idiosyncratic shock factors that affect consumption. The covariate shocks are assumed to be included in the household characteristics.

As proposed by Chaudhuri et al. (2002), the likelihood that a household will fall into poverty is defined as:

$$V_i = Prob (C_i < P | X_i) = \Phi \left(\frac{\ln P - \beta X_i}{\sigma_i} \right) \quad (5.2)$$

Where V_i is the vulnerability indicator, C_i is the per capita consumption expenditure of household i , X_i is a vector of observable household characteristics, P is the poverty line, $\Phi(\cdot)$ is the cumulative density of the standard normal distribution and σ_i is the variance of the error term ε_i .

To estimate vulnerability to expected poverty, the parameters α , β and variance σ_i must be estimated. Chaudhuri et al. (2002), Christiaensen and Subbaro (2005) and Sarris and Karfakis (2006) note that the error term is likely to be heteroskedastic and therefore estimating equation (5.1) directly using ordinary least squares will result in biased estimates. Amemiya (1977) proposed a three-stage feasible generalized least square (FGLS) approach to estimate the parameters to overcome a potential heteroscedasticity problem. The detailed FGLS procedure is presented in the Appendix 5G.

Following Chaudhuri et al. (2002) and Mccarty et al. (2016), we also adopted a threshold of 0.5 to determine vulnerability to expected poverty. A household with a probability of 50% or more of falling into food poverty in the next period (t+1) will be considered to be vulnerable to food poverty.

5.3.2.2 Effect of remittances on vulnerability to poverty

To estimate the effect of remittances on vulnerability to poverty, we specify the following probit equation as:

$$V_i = \delta_0 + \delta_i X_i + \mu_i \quad (5.3)$$

$$Prob(V_i = 1|X_i) = f(X_i\delta) \text{ and } Prob(V_i = 0 |X_i) = 1 - f(X_i\delta) \quad (5.4)$$

Where V_i is the vulnerability to expected poverty of household i and takes a value equal to 1 if a household is classified as vulnerable to poverty and, and 0 if otherwise. A household with a probability of 50% or more of falling into food poverty in the next period ($t+1$) is vulnerable to poverty. X_i is a vector of explanatory variables including individual/household and socio-economic characteristics, δ_i are parameters to be estimated, $f(\cdot)$ is the standard normal cumulative distribution function and μ_i is the random error term.

An expanded form of the empirical model for estimation purposes is specified as:

$$V_i = \delta_0 + \delta_1 Age_i + \delta_2 Age\ squared_i + \delta_3 Sex_i + \delta_4 Educ_i + \delta_5 HHSize_i + \delta_6 Farmsize_i + \delta_7 Remittance_i + \delta_8 Income_i + \delta_9 Credit_i + \delta_{10} Location_i + \delta_{11} Location * Remit_i + \mu_i \quad (5.5)$$

5.3.3 Description of variables

The variables used in the probit model specified in equation (5.5) are defined in Table 5.3 below. The variables include household and household head's characteristics, farm characteristics, income and geographical characteristics. Household characteristics include household size and dependency ratio. The household size could increase or reduce the probability of a household being vulnerable to future consumption. The effect of the household size on household vulnerability to expected poverty depends on the household's dependency ratio (Adepoju & Yusuf, 2012). A household with a high dependency ratio will be more vulnerable to future poverty than those with a lower dependency ratio. Oni and Yusuf (2008), and Bogale (2012) found that household size had significant indirect relationship with vulnerability in Nigeria and Ethiopia respectively.

Female-headed households were more likely to be vulnerable to expected poverty compared to their male counterparts (Barros et al., 1997). Buvinic and Gupta (1997) explained that female heads typically work for lower wages and have less access to

productive assets than men due to gender bias against women. Again, women typically bore the burden of household chores, which results in time and mobility constraints (Buvinic & Gupta, 1997).

Households in big cities and towns tend to have higher expectations of future consumption per capita compared to rural households (Tigre, 2019).

It is expected that if a person has more years of formal education, the amount of non-farm income leading to higher household income will be higher. Oni and Yusuf (2008) found that the expected poverty trend is highest in households without education.

Households with high incomes are expected to be less vulnerable to future consumption. Baiyegunhi and Fraser (2010) found years of schooling to be significantly and negatively related to vulnerability to poverty in South Africa. Literacy and educational attainments decreased poverty and vulnerability to poverty. Households with younger heads and aged household heads were more vulnerable to consumption in future, while middle-aged household heads were less vulnerable to expected poverty (Oni & Yusuf, 2008).

The size of the farm and the amount of credit received have a direct effect on the household's nominal income. The size of a farm is expected to be positively correlated with farm production. With higher farm production, households are expected to receive more sales from farm outputs, leading to increased household income. Households with high incomes are expected to be less vulnerable to future consumption (Adepoju & Yusuf, 2012) and with access to credit can borrow to consume in difficult times. This has the potential to increase disposable income for future consumption.

Table 5.3: Variable description

Variable	Variable description
<u>Dependent variable</u>	
Vulnerability	Vulnerability to expected poverty takes a value equal to 1 if vulnerability index is greater than 0.5, and 0 otherwise.
<u>Independent variables</u>	
Remittances	Receipt of any type of remittances. Dummy variable, Remittance recipient =1, otherwise =0
Sex	Biological sex of the household head. Dummy variable, Male =1, otherwise =0
Age	Number of complete years of the head of the household
Household size ⁵	Number of people who live together in the same housing unit
Years of education	Total number of years of formal education of the household head
Income	Total nominal income of all members of the household in US\$
Credit	Amount of money received as credit by a household in US\$
Rural/urban location	Nature of the dwelling community of a household. Dummy variable, urban =1, rural =0
Farm size	Total area of farm measured in acres
Dependency ratio	Ratio of number of dependent members of a household (aged less than 15 and equal to or above 65) to the number of working age household members (aged 15 to 64).

⁵ The household size is the number of people who live together in the same housing unit, who acknowledge one person as the head of the household, share the same housekeeping and cooking arrangements

5.4 RESULTS AND DISCUSSION

5.4.1 Summary statistics

Table 5.4 and Table 5.5 present the summary statistics of the variables used in the study for The Gambia, Ghana, and Nigeria. About 30% of households in Ghana and Nigeria received remittances, while about 41% of households received remittances in The Gambia. The mean remittances received in The Gambia (USD 252.54) were higher than the mean remittance receipts in Ghana and Nigeria. The mean ages of the household head for the three countries were about 49 years (The Gambia and Ghana) and 50 years (Nigeria). The mean ages of the sample indicate that there were fewer youthful farmers in the sample across all three countries. The similarities in the standard deviation, minimum and maximum ages also show a homogenous demographic structure in the three countries.

The mean years of education of the household head were between 9 for The Gambia and 8 for Ghana and Nigeria. This means that, on average, each household head in the study sample had at least a basic education. Basic education is important in household and farm investment decision-making for agricultural households.

The mean dependency ratios in Ghana and Nigeria are 99% and 109%, respectively, while The Gambia had a mean dependency ratio of 125%. An age dependency ratio of 99% means that there were 99 dependent members (aged less than 15 and equal to or above 65) for every 100 working-aged adult. On average, there were more dependent household members in The Gambia than in Ghana and Nigeria. A corresponding high mean household size corroborated the relatively higher dependency ratio in The Gambia. The mean household sizes for the countries were approximately 9, 5 and 7 for The Gambia, Ghana, and Nigeria, respectively.

The proportion of households in urban areas was 8.55% for The Gambia and about 16% for Ghana and Nigeria. This distribution indicates that the households in the sample were largely rural. Farming in West Africa is largely a rural activity, with the urban centres serving as a market for rural production. The proportion of households engaged in urban agriculture was mainly involved in perishable crop production, such as vegetable farming.

Table 5.4: Descriptive statistics of variables used by countries

Variable	The Gambia	Ghana	Nigeria
Gender (%)			
<i>Male</i>	86.93	75.67	82.65
<i>Female</i>	13.07	24.33	17.35
Location (%)			
<i>Urban</i>	8.55	15.72	15.82
<i>Rural</i>	91.45	84.28	84.18
Remittance (%)			
<i>Remittance receiving</i>	41.43	30.80	29.78
<i>Non remittance receiving</i>	58.57	69.20	70.22

Table 5.5: Descriptive statistics of variables used by countries

Variable	The Gambia				Ghana				Nigeria				A priori expectation
	Mean	Std dev	Min.	Max.	Mean	Std dev	Min.	Max.	Mean	Std dev	Min.	Max.	
Age	49.23	14.31	16	98	48.76	15.52	16	99	50.04	15.08	17	99	+/-
Education	9.01	3.99	0	22	8.48	3.95	0	27	8.38	5.17	0	20	-
Farm size	12.25	24.58	0	999.28	6.01	7.30	0.0167	126.7	2.96	4.34	0	115.59	-
Household size	8.82	5.46	1	82	5.06	3.11	1	28	6.60	3.70	1	33	+
Remittance	252.54	861.27	0	36,018.96	62.59	348.25	0	22,988	55.41	242.09	0	5,950.63	+/-
Income	1,423.34	4,103.19	3.55	318,914.7	4066.24	30,489.15	0	1,775,587	626.10	1,515.51	0	26,326.63	-
Credit	57.43	373.26	0	30,805.69	48.53	713.40	0	57,471.27	32.96	206.54	0	6,539.15	-
Dep_ratio	1.25	0.85	0	9	0.99	0.89	0	11	1.09	0.89	0	8	+

5.4.2 Test for multicollinearity: Correlation analysis

The study tests for multicollinearity among the variables used in the analysis for each country. Explanatory variables that are highly correlated in a model can influence the validity of the estimated parameters. When the explanatory variables are highly correlated, it is difficult to disentangle the separate effects of each of the explanatory variables on the dependent variable (Maddala & Lahiri, 1992). The correlation matrix was therefore constructed to test for multicollinearity among the explanatory variables.

Table 5.7 - Table 5.9 present the correlation matrix for the country level explanatory variables. Household income and credit received are highly correlated in The Gambia with a correlation coefficient of about 90%. The variance inflation factor (VIF) was further used to check for the presence of multicollinearity among the variables. A high VIF indicates that the variable is highly correlated to other variables in the model.

The result of the VIF is presented in Table 5.6. The high correlation between household income and credit received in The Gambia is confirmed with VIF of about 5. As a rule of thumb, VIF greater than 5 indicates the presence of multicollinearity among the variables.

Table 5.6: Variance inflation factor

Variable	The Gambia	Ghana	Nigeria
	VIF	VIF	VIF
Age	1.11	1.07	1.16
Gender	1.17	1.16	1.10
Education	1.08	1.09	1.17
Farm size	1.02	1.08	1.08
Household size	1.16	1.27	1.26
Remittance	1.07	1.06	1.08
Rural/Urban	1.07	1.05	1.05
Household Income	5.03	1.03	1.12
Credit received	5.00	1.01	1.02
Dep. ratio	1.10	1.24	1.17
Mean VIF	1.88	1.11	1.12

Table 5.7: Correlation matrix for The Gambia

Variables	Vulnerability	Age	Gender	Education	Farm size	Household size	Remittance	Rural/urban	Income	Credit	Dep. ratio
Vulnerability	1										
Age	0.119	1									
Gender	0.131	0.16	1								
Education	-0.195	0.102	0.1767	1							
Farm size	0.067	0.03	0.0655	-0.0012	1						
Household size	0.501	0.249	0.1496	0.0427	0.1225	1					
Remittance	-0.181	0.004	-0.225	-0.0213	0.0026	0.0262	1				
Rural/urban	-0.381	0.118	0.01	0.1602	-0.0756	0.0073	0.0526	1			
Household income	-0.041	0.062	0.0224	0.0607	0.0107	0.1363	0.0514	0.0931	1		
Credit received	-0.042	0.045	0.0321	0.0898	0.0026	0.0934	0.0224	0.105	0.8925	1	
Dep. ratio	0.413	0.081	-0.155	-0.111	0.020	0.186	0.020	-0.101	-0.017	-0.013	1

Table 5.8: Correlation matrix for Ghana

Variables	Vulnerability	Age	Gender	Education	Farm size	Household size	Remittance	Rural/urban	Income	Credit	Dep. ratio
Vulnerability	1										
Age	-0.117	1									
Gender	0.045	-0.118	1								
Education	-0.358	0.032	0.1924	1							
Farm size	-0.045	0.117	0.1573	0.0298	1						
Household size	0.604	0.065	0.1386	-0.0338	0.1837	1					
Remittance	-0.058	0.149	-0.176	0.0108	-0.0091	-0.0358	1				
Rural/urban	-0.31	0.051	-0.028	0.1723	-0.0318	-0.048	-0.0058	1			
Household Income	-0.041	-0.005	0.0323	0.0552	0.0892	0.049	0.0066	0.0654	1		
Credit received	-0.033	0.004	0.0215	0.0453	0.027	0.0088	0.0327	0.0077	0.0909	1	
Dep. ratio	0.5124	-0.024	-0.112	-0.135	-0.011	0.381	0.061	-0.087	-0.024	-0.016	1

Source: Author's computation based on the 2017 GLSS VII data for Ghana.

Table 5.9: Correlation matrix for Nigeria

Variables	Vulnerability	Age	Gender	Education	Farm size	Household size	Remittance	Rural/urban	Income	Credit	Dep. ratio
Vulnerability	1										
Age	0.065	1									
Gender	0.12	-0.142	1								
Education	-0.22	-0.193	0.09	1							
Farm size	0.243	-0.056	0.1396	-0.0524	1						
Household size	0.68	0.112	0.1818	-0.1022	0.188	1					
Remittance	-0.151	0.212	-0.167	-0.0054	-0.1155	-0.0513	1				
Rural/urban	-0.152	0.035	-0.051	0.1526	-0.1032	-0.0452	0.0124	1			
Household Income	-0.026	0.069	0.0512	0.2183	0.0917	0.1303	-0.0085	0.0912	1		
Credit received	-0.037	0.04	0.0062	0.0633	-0.0259	-0.002	0.0455	0.0651	0.0942	1	
Dep. ratio	0.2592	-0.069	0.0881	-0.121	0.0417	0.3322	-0.0157	-0.0121	-0.0571	0.0092	1

5.4.3 THE EMPIRICAL RESULTS

5.4.3.1 Vulnerability to expected poverty of agricultural households in the three countries

The average vulnerability to expected poverty is estimated for the three countries using the three-step feasible generalised least squares (FGLS) estimation procedure and reported in Table 5.10.

The results show that about 64%, 42.6% and 27% of agricultural households in The Gambia, Ghana and Nigeria were vulnerable to expected poverty. These estimates are higher than the national observed poverty level of 48% and 23.4% for The Gambia and Ghanaian households, respectively, while Nigeria’s vulnerability to expected poverty estimate is less than the national poverty rate of 40%.

The differences in vulnerability and poverty rates are consistent with the literature. For instance, Appiah-Kubi and Oduro (2008), Novignon (2010), and Azam and Imai (2009) found that vulnerability to poverty was higher than poverty levels. These results imply a high probability that the poverty rates in Ghana and The Gambia will rise if no poverty reduction policies and measures are implemented.

Table 5.10: Mean vulnerability to expected poverty

	The Gambia	Ghana	Nigeria
Genderⁱ	(-.161)***	(-.028)***	(-.128)***
Male	.656	.432	.286
Female	.495	.404	.159
Locationⁱ	(.397)***	(.331)***	(.198)***
Urban	.302	.163	.100
Rural	.699	.494	.298
Remittanceⁱ	(.120)***	(.054)***	(.116)***
Remittance receiving	.573	.389	.190
Non remittance receiving	.693	.444	.305
National	.643	0.426	.269

Note: 1. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.
 2. *i* - Figures in parenthesis are mean differences

In all three countries, male-headed households were more vulnerable to consumption than female-headed households. The differences in the mean vulnerability for gender were statistically significant at 1% significance value (p value <1) for all three countries.

Similarly, rural households were found to be more vulnerable than urban households in all three countries. Households that received remittances were found to have less mean vulnerability than households that did not receive remittances in all three countries.

The distribution of households with vulnerability to expected poverty indices greater than the 0.5 threshold are presented in Figure 5.1 below. The horizontal axis measures the vulnerability to poverty indices while the vertical axis is the corresponding percentage of households in the sample. The figure shows that a greater percentage of households in The Gambia (68.38%) is above the vulnerability threshold of 0.5. While 42.08% and 14.47% of households were above the vulnerability threshold of 0.5 in Ghana and Nigeria respectively.

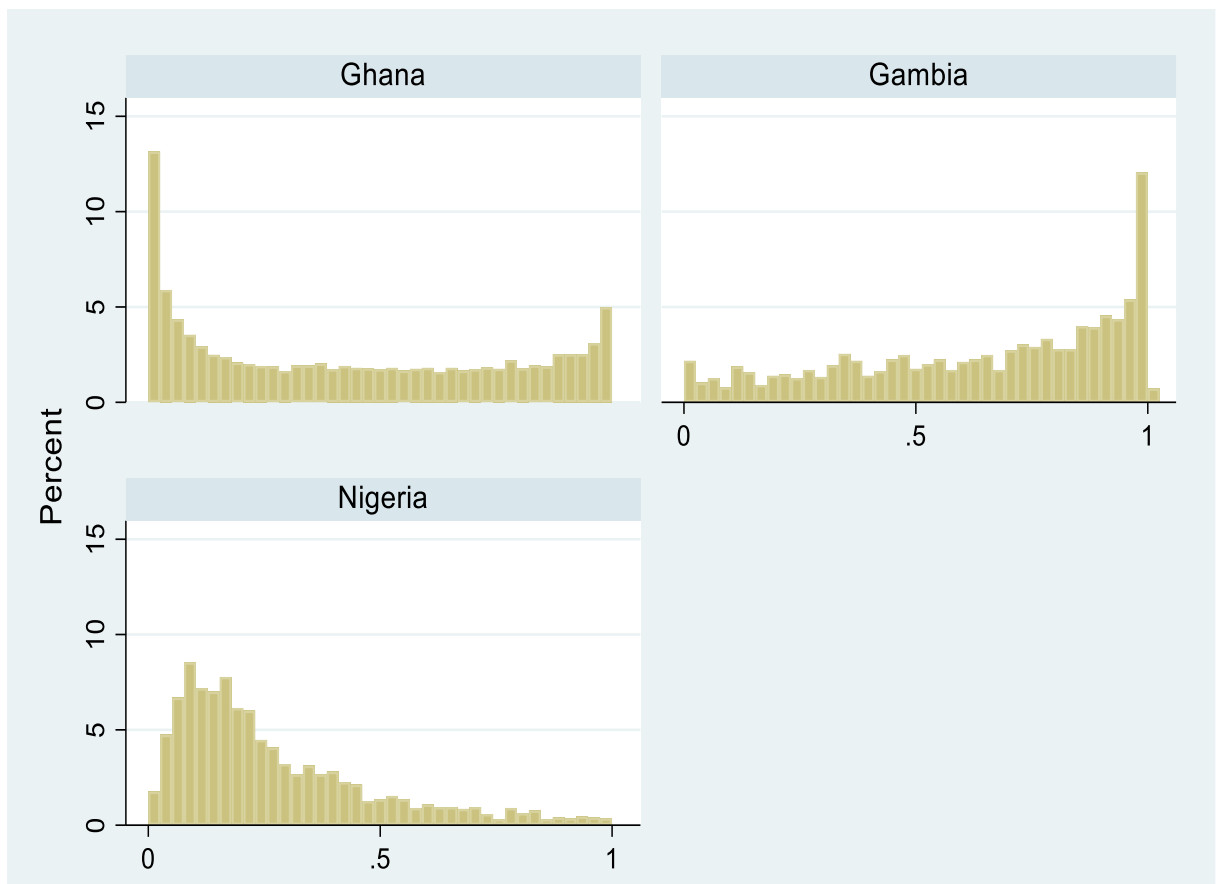


Figure 5.1: Distribution of vulnerability to expected poverty

5.4.3.2 Determinants of vulnerability to expected poverty in in the three countries

The probit results and the resulting marginal effects of the probit models are presented in Table 5.11.

The marginal effect estimates show that years of education of household head, household size, remittances, location and household income significantly affect the vulnerability of households to expected poverty in all three countries. In addition to these factors, farm size and credit also significantly affect household vulnerability to expected poverty in Ghana and Nigeria.

Even though credit and income had statistically significant marginal effects, the predicted probabilities are less than 1%. This means these factors have less influence in predicting the probability of expected poverty in the households. The signs of the marginal effects

for these explanatory variables are all negative and consistent with the *a priori* expectations.

The marginal effects of years of education for the household head are negatively related to vulnerability and consistent with *a priori* expectations. The results show that an increase in the years of schooling of a household head decreases the probability of a household being vulnerable to expected poverty by 2.3%, 3.8% and 0.7% for The Gambia, Ghana, and Nigeria, respectively. The results indicate that education has a stronger influence on vulnerability in Ghana than in The Gambia and Nigeria. This might be due to the higher average literacy rate of 79% in Ghana compared to 62% in Nigeria and 50.8% in The Gambia.

The negative relationship between education and vulnerability is consistent with the literature. For example, Baiyegunhi and Fraser (2010) found years of schooling to be significantly and negatively related to vulnerability to poverty in South Africa. The intuition behind the relationship between education and vulnerability is that farming households with higher education have higher chances of securing off-farm income, which increases the household's ability to cope with consumption shocks, therefore being less vulnerable to expected poverty.

Table 5.11: Effect of remittances on vulnerability to expected poverty

Explanatory variables	The Gambia				Ghana				Nigeria			
	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE
Age	0.0211	0.0328	0.0017	0.0027	-0.1152***	0.0181	-0.0109***	0.0017	0.0401	0.0695	0.0006	0.0011
Age squared	-0.0004	0.0004	0.0000	0.0000	0.0008***	0.0002	0.0001***	0.0000	-0.0005	0.0007	0.0000	0.0000
Gender	0.1112	0.2146	0.0092	0.0176	-0.1407	0.0974	-0.0133	0.0092	0.7817	0.5768	0.0121	0.0088
Education	-0.2761***	0.0234	-0.0227***	0.0013	-0.4044***	0.0180	-0.0382***	0.0010	-0.4214***	0.0542	-0.0065***	0.0005
Farm size	-0.0031	0.0059	-0.0003	0.0005	-0.1411***	0.0085	-0.0133***	0.0007	0.1210***	0.0182	0.0019***	0.0002
Household size	1.1065***	0.0692	0.0910***	0.0019	1.2643***	0.0469	0.1194***	0.0011	2.6153***	0.2973	0.0406***	0.0009
Remittance	-1.6780***	0.1691	-0.1381***	0.0113	-0.4301***	0.0897	-0.0406***	0.0083	-6.2483***	0.8281	-0.0970***	0.0073
Rural/urban	-4.9177***	0.3843	-0.4046***	0.0204	-3.5231***	0.1831	-0.3327***	0.0128	-15.154***	2.1130	-0.2352***	0.0197
Household income	-0.0001***	0.0000	0.0000***	0.0000	0.0000***	0.0000	0.0000***	0.0000	-0.0016***	0.0003	0.0000***	0.0000
Credit received	-	-	-	-	-0.0006***	0.0002	-0.0001***	0.0000	-0.0023	0.0021	0.0000	0.0000
Remittance*rural	-0.8680**	0.4351	0.0714**	0.0357	-0.2041	0.2755	0.0193	0.0260	-8.1654	292.63	0.1267	4.5419
Constant	-2.4608***	0.6957	-	-	2.0778***	0.4105	-	-	-22.998***	3.2673	-	-
No of observations	1,651				4,097				2,212			
Pseudo R2	0.7641				0.7548				0.9325			
LR Chi2	1574.22				4209.20				1705.27			
Prob > chi2	0.0000				0.0000				0.0000			

Note: ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

The age of the household head was significant only in the Ghanaian model. The marginal effect of age is negatively related to vulnerability and consistent with *a priori* expectations. The results show that as the age of the household head increased, vulnerability to expected poverty reduced.

The squared term of age is also significant and positively related to vulnerability to expected poverty. This implies a quadratic relationship between age and vulnerability to expected poverty in Ghana. Hence, an initial increase in the age of the household head reduces vulnerability, but beyond a certain age, the vulnerability begins to diminish as age increases.

This result is consistent with *a priori* expectations that income is low at the early and late stages of life. The age of household heads in the Ghanaian sample ranged from 16 to 99 years. *Ceteris paribus*, as individuals grow, they accumulate experiences and increase their income. As they get very old and retire from work, their income level falls. This explains the quadratic relationship between age and vulnerability to expected poverty.

Household size is positively related to vulnerability to expected poverty in the estimated model for all three countries. The estimated probabilities of household size's influence on expected poverty ranged from 4.06% (Nigeria) to 11.94% (Ghana). Larger-sized households are more likely to be vulnerable in the future, as shown in the positive relationship with expected poverty in all three countries. This result is corroborated by Oni and Yusuf (2008), and Bogale (2012), who found household size to have a significant indirect relationship with vulnerability in Nigeria and Ethiopia, respectively.

Farm size had mixed results for all three countries. In The Gambia, farm size did not significantly affect vulnerability to expected poverty. The marginal effects of farm size in Ghana and Nigeria were significant at a 1% level. However, only Ghana had farm size negatively related to vulnerability to expected poverty. This means households with relatively larger farm sizes have less probability of being vulnerable to expected poverty in Ghana.

However, the result for Nigeria was inconsistent with *a priori* expectations. In Nigeria, households with relatively larger farm sizes have a 0.19% probability of being vulnerable to expected poverty than households with smaller farms. This result from Nigeria could be explained by the efficiency levels of small farms being higher than large farms.

Aye and Mungatana (2010), who found an inverse relationship between farm size and farmers' technical efficiency in Nigeria, explained that increased farm size diminishes the timeliness of input use, leading to declining technical efficiency. As a result, technical inefficiency leads to a loss in output, affecting the farm's profitability.

The marginal effect of remittances on expected poverty is statistically significant at 1% for all three countries. The estimated probabilities are all negatively related to vulnerability to expected poverty ranging from 4% (Ghana) to 13.81% (The Gambia).

Households receiving remittances are less likely to be vulnerable in the future, as shown in the negative relationship with expected poverty in all three countries. This relationship is consistent with the *a priori* expectations. The result is consistent with the life cycle and permanent income hypotheses by confirming that remittances form part of household lifetime income and have direct relationship with future consumption. The results show the importance of remittances in vulnerability to expected poverty among agricultural households and are consistent with that of Adepaju and Yusuf (2012), who found that remittances reduce vulnerability in rural South-West Nigeria.

We further pooled the individual datasets for each country into a cross-sectional dataset and added year and country fixed effects to allow us to explore how vulnerability responds to remittances as they change over time. Similar to the results obtained for all three countries, the marginal effect of remittances on expected poverty was statistically significant at 1% in the pooled cross-sectional dataset. The results of the pooled cross-sectional data is presented in Table 5.12.

A household's location strongly influences its vulnerability in all three countries. The marginal effect for rural/urban locations is statistically significant at a 1% level for all countries. The location variable is a dummy variable measured as 1 if a household is

located in an urban area and 0 if otherwise. Therefore, there are 40%, 33% and 24% probability of an urban household being less vulnerable to expected poverty than households in rural areas in The Gambia, Ghana and Nigeria, respectively.

We interacted remittances with the location of households to assess the location effects of remittances on vulnerability to expected poverty. In all three countries, rural households receiving remittances were less vulnerable to expected poverty. However, only the marginal effects of the rural household receipt of remittance for The Gambia are statistically significant at 5% significance level.

Table 5.12: Effect of remittances on vulnerability to expected poverty (pooled cross-sectional data)

Variable	Marginal effect	Std. Dev.
Remittance	-0.1152***	0.0106
Rural/urban	-0.4078***	0.0172
Rem*Location	0.0542*	0.0325
Year	-0.2464***	0.0066
Country	-0.0290***	0.0064
No of observations	7,960	
Pseudo R2	0.1996	
LR Chi2	2136.81	
Prob > chi2	0.0000	

5.4.4 ROBUSTNESS ANALYSIS

The study performs additional analysis to account for possible selection and endogeneity bias, which can arise from wealthier households self-selecting themselves into migrating and remitting wealthier dependents. This self-selecting bias can result in endogeneity between remittances and vulnerability to expected poverty.

We employed the Heckman sample selection model and propensity score matching methods to correct these. First, we estimated a Heckman model and where sample selection and results are reported in Table 5.11. The results of the Heckman model's second⁶ stage (outcome model) (see Table 5.14) show a statistically insignificant inverse

⁶ The results of the first stage (selection model) of the Heckman model are shown in the appendix.

mills ratio in Ghana’s second stage probit model. This means that the Ghanaian sample does not suffer from a selection bias.

However, the inverse mills ratio was statistically significant at a 5% significance level and 10% significance level for the second stage probit model for The Gambia and Nigeria respectively. This means The Gambia and Nigeria sample suffers from a selection bias. Consequently, we used propensity score matching to correct the sample selection bias in The Gambia and Nigeria and estimated the treatment effect.

The results of the estimated treatment effect of remittances on vulnerability to expected poverty using propensity-score matching and nearest neighbour matching estimators showed a negative and statistically significant effect, similar to the results from the probit model (see Table 5.13).

The study performed further analysis using remittance as a continuous variable to estimate its effect on vulnerability to poverty. The results generally did not change from the result obtained using remittance as a dummy variable. The marginal effect of remittances on expected poverty is statistically significant at 1% for The Gambia and Nigeria, and significant at 10% for Ghana. The estimated marginal effects are all negatively related to vulnerability to expected poverty. We included the squared term of remittances in the model to determine if remittance has a nonlinear relationship with vulnerability to expected poverty. Even though the sign of the squared term changes to positive, the magnitude of the coefficient and the marginal effects are all close to zero in all three models (see Appendix 5G).

Table 5.13: Estimation of the treatment effect of remittances on vulnerability to expected poverty in The Gambia and Nigeria

Estimators	The Gambia		Nigeria	
	Coef.	Robust SE	Coef.	Robust SE
Propensity score matching (PSM) – (1 to 5 matching)	-0.1423***	0.0159	-0.0905***	0.0126
Nearest neighbour matching (NNM)	-0.1592***	0.0149	-0.0948***	0.0078

Table 5.14: Results of the Heckman model

Explanatory variables	The Gambia				Ghana				Nigeria			
	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE
Age	-0.0817	0.0619	-0.0067	0.0051	-0.1246	0.0836	-0.0118	0.0079	-0.0313	0.0876	-0.0005	0.0013
Age squared	0.0008	0.0007	0.0001	0.0001	0.0010	0.0011	0.0001	0.0001	0.0029	0.0022	0.0000	0.0000
Gender	-1.6887*	0.9048	-0.1387*	0.0738	-0.2651	1.0815	-0.0250	0.1021	-6.1977	4.2178	-0.0925	0.0622
Education	-0.2703***	0.0236	-0.0222***	0.0014	-0.4011***	0.0337	-0.0379***	0.0029	-0.2408**	0.1147	-0.0036**	0.0017
Farm size	-0.0016	0.0060	-0.0001	0.0005	-0.1409***	0.0089	-0.0133***	0.0007	-0.5179	0.3574	-0.0077	0.0053
Household size	1.1351***	0.0724	0.0932***	0.0023	1.2644***	0.0468	0.1194***	0.0011	2.7119***	0.3087	0.0405***	0.0010
Remittance	-1.6776***	0.1697	-0.1378***	0.0113	-0.4301***	0.0897	-0.0406***	0.0083	-6.4340***	0.8444	-0.0960***	0.0069
Rural/urban	-4.6085***	0.4044	-0.3786***	0.0245	-3.5401***	0.2353	-0.3343***	0.0191	-16.7235***	2.2989	-0.2495***	0.0203
Household income	0.0000**	0.0000	0.0000**	0.0000	0.0000***	0.0000	0.0000***	0.0000	-0.0019***	0.0003	0.0000***	0.0000
Credit received	-	-	-	-	-0.0006	0.0004	-0.0001	0.0000	0.0005	0.0028	0.0000	0.0000
IMR	2.6990**	1.3339	0.2217**	0.1087	0.3142	2.7205	0.0297	0.2569	21.0576*	12.4211	0.3142*	0.1823
Remittance*rural	-0.8778**	0.4341	-0.0721**	0.0355	-0.2046	0.2755	-0.0193	0.0260	-7.5710	362.9053	-0.1130	5.4148
Constant	-1.6804**	0.8176	-	-	1.9412	1.2525	-	-	-47.3048***	14.5678	-	-
No of observations		1,651				4,097				2,212		
Pseudo R²		0.7646				0.7548				0.9353		
LR Chi2		1575.32				4209.21				1710.25		
Prob > chi2		0.0000				0.0000				0.0000		

Note: ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

5.5 CONCLUSION

Understanding the determinants of vulnerability to the expected poverty of households is important to help policymakers design and implement targeted social protection policies that have maximum impacts. The paper sought to assess the effect of remittances on vulnerability to expected poverty among agricultural households in The Gambia, Ghana and Nigeria.

The results show a significant negative relationship between remittances and vulnerability to expected poverty in all three countries. Further robust analysis using the Heckman model and propensity score matching technique confirmed the statistically significant negative relationship between remittances and vulnerability to expected poverty.

Other findings showed that education attainments, household size, remittance, and location are significant factors influencing the vulnerability to expected poverty in The Gambia, Ghana and Nigeria.

Rural households are more vulnerable to expected poverty. However, rural households that received remittances were less vulnerable to expected poverty. Receipt of remittances generally helped reduce agricultural households' vulnerability to expected poverty. Given the role of remittances in reducing vulnerability to expected poverty, it is recommended that governments and money transfer operators should reduce the cost of sending remittances, especially to rural farming households, to ensure increased remittance flow as an indirect way of reducing vulnerability to expected poverty.

The vulnerability to expected poverty results shows that poverty and vulnerability to poverty are independent concepts. Hence, policies directed towards poverty reduction in sub-Saharan Africa must consider that more households are vulnerable to poverty compared to poor households. If the resilience of vulnerable households is not built, poverty rates will increase.

APPENDICES

Appendix 5A: Determinants of consumption for Ghana

Explanatory variables	Coef.	Std. err.	Prob.
Age	0.0024	0.0008	0.001
Gender	-0.0479	0.0274	0.081
Education	0.0433	0.0027	0.000
Farm size	0.0138	0.0014	0.000
Household size	-0.1112	0.0042	0.000
Remittance	0.0510	0.0226	0.024
Rural/Urban	0.3526	0.0261	0.000
Household Income	0.0000	0.0000	0.000
Credit received	0.0000	0.0000	0.001
Dependency ratio	-0.1529	0.0137	0.000
Constant	6.1247	0.0492	0.000

No of Observations	4,097
R-squared	0.3411
F-statistic	211.51
Prob > F	0.0000

Appendix 5B: Heckman first stage estimation for Ghana

Dep. Variable (Remittance)	Coef.	Std. err.	Prob.
Age	-0.0470	0.0092	0.000
Age squared	0.0006	0.0001	0.000
Gender	-0.5659	0.0527	0.000
Education	0.0138	0.0055	0.012
Farm size	0.0011	0.0028	0.698
Household size	0.0021	0.0081	0.798
Rural/urban	-0.0768	0.0530	0.148
Income	0.0000	0.0000	0.631
Credit	0.0002	0.0001	0.011
Constant	0.6065	0.2169	0.005

No of Observations	4,097
Pseudo R2	0.0488
LR chi2	251.66
Prob > F	0.0000

Appendix 5C: Determinants of consumption for Nigeria

Explanatory variables	Coef.	Std. err.	Prob.
Age	-0.0011	0.0022	0.611
Gender	-0.0186	0.0917	0.839
Education	0.0152	0.0061	0.013
Farm size	-0.0055	0.0068	0.419
Household size	-0.1087	0.0091	0.000
Remittance	0.2395	0.0655	0.000
Rural/Urban	0.6412	0.0848	0.000
Household Income	0.0001	0.0000	0.001
Credit received	0.0002	0.0001	0.117
Dependency ratio	-0.0532	0.0358	0.137
Constant	7.1701	0.1598	0.000
No of Observations	2,209		
R-squared	0.1309		
F-statistic	33.10		
Prob > F	0.0000		

Appendix 5D: Heckman first stage estimation for Nigeria

Dep. Variable (Remittance)	Coef.	Std. err.	Prob.
Age	-0.0104	0.0132	0.433
Age squared	0.0003	0.0001	0.026
Gender	-0.4946	0.0863	0.000
Education	0.0122	0.0061	0.046
Farm size	-0.0367	0.0094	0.000
Household size	-0.0009	0.0090	0.923
Rural/urban	-0.0669	0.0832	0.422
Income	0.0000	0.0000	0.560
Credit	0.0002	0.0001	0.094
Constant	-0.2945	0.3374	0.383

No of Observations	2,212
Pseudo R2	0.0637
LR chi2	173.53
Prob > F	0.0000

Appendix 5E: Determinants of consumption for Gambia

Explanatory variables	Coef.	Std. err.	Prob.
Age	0.0011	0.0012	0.369
Gender	-0.0819	0.0520	0.116
Education	0.0165	0.0034	0.000
Farm size	0.0002	0.0006	0.741
Household size	-0.0636	0.0032	0.000
Remittance	0.1095	0.0273	0.000
Rural/Urban	0.3330	0.0387	0.000
Household Income	0.0000	0.0000	0.001
Dependency ratio	-0.1063	0.0169	0.000
Constant	6.3105	0.0720	0.000

No of Observations	1,651
R-squared	0.3004
F-statistic	78.28
Prob > F	0.0000

Appendix 5F: Heckman first stage estimation for Gambia

Dep. Variable (Remittance)	Coef.	Std. err.	Prob.
Age	-0.0619	0.0162	0.000
Age squared	0.0007	0.0002	0.000
Gender	-1.1511	0.1328	0.000
Education	0.0034	0.0083	0.683
Farm size	0.0008	0.0014	0.556
Household size	0.0148	0.0077	0.053
Rural/urban	0.1675	0.0932	0.072
Income	0.0000	0.0000	0.003
Constant	1.8780	0.3575	0.000

No of Observations	1,651
Pseudo R2	0.0550
LR chi2	123.38
Prob > F	0.0000

Appendix 5G: Effect of remittances on vulnerability to expected poverty (remittance measured as continuous variable)

Explanatory variables	The Gambia				Ghana				Nigeria			
	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE	Coef.	Robust SE	Marginal effects	Robust SE
Age	0.0421	0.0292	0.0039	0.0027	-0.1093***	0.0178	-0.0105***	0.0017	0.0186	0.0467	0.0006	0.0016
Age squared	-0.0006	0.0003	-0.0001	0.0000	0.0008***	0.0002	0.0001***	0.0000	-0.0003	0.0004	0.0000	0.0000
Gender	0.3854	0.2073	0.0357	0.0191	-0.0993	0.0965	-0.0095	0.0092	0.2827	0.3784	0.0097	0.0130
Education	-0.2358***	0.0206	-0.0218***	0.0014	-0.3968***	0.0177	-0.0380***	0.0010	-0.2132***	0.0243	-0.0073***	0.0006
Farm size	-0.0046	0.0060	-0.0004	0.0006	-0.1378***	0.0084	-0.0132***	0.0007	0.0749***	0.0139	0.0026***	0.0004
Household size	0.9626***	0.0578	0.0891***	0.0018	1.2433***	0.0458	0.1189***	0.0010	1.2899***	0.0989	0.0444***	0.0012
Remittance	-0.0017***	0.0002	-0.0002***	0.0000	-0.0006*	0.0003	-0.0001*	0.0000	-0.0068***	0.0011	-0.0002***	0.0000
Remittance squared	0.0000***	0.0000	0.0000***	0.0000	0.0000*	0.0000	0.0000*	0.0000	0.0000***	0.0000	0.0000***	0.0000
Rural/urban	-4.0008***	0.3286	-0.3701***	0.0219	-3.3642***	0.1769	-0.3218***	0.0127	-6.6650***	0.8586	-0.2293***	0.0249
Household income	-0.0001***	0.0000	0.0000***	0.0000	0.0000***	0.0000	0.0000***	0.0000	-0.0007***	0.0001	0.0000***	0.0000
Credit received	-	-	-	-	-0.0006***	0.0002	-0.0001***	0.0000	-0.0013	0.0009	0.0000	0.0000
Remittance*rural	-1.5636***	0.4323	-0.1446***	0.0394	-0.1165	0.2663	-0.0111	0.0255	3.4556***	1.1657	0.1189***	0.0394
Constant	-3.3325***	0.6325	-	-	1.8369***	0.4027	-	-	-11.646***	1.4831	-	-
No of observations		1,647				4,097				2,212		
Pseudo R2		0.7299				0.7512				0.8508		
LR Chi2		1499.30				4189.24				1555.83		
Prob > chi2		0.0000				0.0000				0.0000		

Appendix 5H: Vulnerability as expected poverty (VEP)

A stochastic consumption model of a Household i is specified as follows:

$$\ln C_i = \alpha X_i + \varepsilon_i \quad (1)$$

Where C_i is the per capita consumption expenditure of household, X_i is a set of observable household characteristics variables, α is a vector of parameters to be estimated, and ε is a zero mean error term of the model with normal distribution containing the idiosyncratic shock factors that affect consumption. The covariate shocks are assumed to be included in the household characteristics.

The variance of the error term ($\sigma_{\varepsilon,i}^2$) is assumed to be related to the characteristics of the household (X) as follows:

$$\sigma_{\varepsilon,i}^2 = \beta X_i + v_i \quad (2)$$

Where v is the random error term of the model.

To estimate the parameters α and β , Amemiya (1977) proposed a three-stage Feasible Generalized Least Square (FGLS) approach to estimate the parameters to overcome potential heteroscedasticity problem. FGLS procedure involves the initial estimation of equation (1) using OLS, then estimate equation (2) again by OLS using the squared residuals from equation (1) as the dependent variable. The predicted estimates in equation (2) are used to transform equation (2) as follows:

$$\frac{\sigma_{\varepsilon,i}^2}{\beta_i X_i} = \beta \left(\frac{X_i}{\beta_i X_i} \right) + \frac{v_i}{\beta_i X_i} \quad (3)$$

Equation (3) is estimated using OLS regression method to derive the parameters β . The estimated parameters using the FGLS are asymptotically efficient denoted by $\hat{\beta}_{FGLS}$. The $\hat{\beta}_{FGLS}$ is a consistent estimate of standard error $\hat{\sigma}_{\varepsilon,i}$, and therefore can be expressed as follows:

$$\hat{\sigma}_{\varepsilon,i} = \sqrt{X_i \hat{\beta}_{FGLS}} \quad (4)$$

Equation (4) is then used to re-estimate equation (1) as follows:

$$\frac{\ln C_i}{\hat{\sigma}_{\varepsilon,i}} = \alpha \left(\frac{X_i}{\hat{\sigma}_{\varepsilon,i}} \right) + \frac{v_i}{\hat{\sigma}_{\varepsilon,i}} \quad (5)$$

$\hat{\alpha}_{FGLS}$ is asymptotically consistent and efficient estimate. Given $\hat{\alpha}_{FGLS}$ and $\hat{\theta}_{FGLS}$, the expected value of consumption and the corresponding variance of the household with characteristics X_i are equal to:

$$E \left[\left(\frac{\ln \hat{C}_i}{X_i} \right) \right] = \hat{\alpha} X_i \quad (6)$$

$$Var \left[\left(\frac{\ln \hat{C}_i}{X_i} \right) \right] = \sigma_i^2 = \hat{\beta} X_i \quad (7)$$

From equation (6) and (7), the vulnerability of the household can be estimated as follows:

$$V_{it} = Prob(C_{i,t+1} < P | X_i) = \phi \left(\frac{\ln P - \hat{\alpha} X_i}{\sqrt{\hat{\beta} X_i}} \right) \quad (8)$$

Where V_{it} is the vulnerability to poverty of household i at time t , $\phi(\cdot)$ is the cumulative density of the standard normal distribution and P is the poverty line.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This final chapter presents the summary of the findings of the study, draws conclusions, and makes recommendations for future research.

Existing literature on remittances in sub-Saharan Africa primarily studied the aggregate effect of remittances on economic growth and poverty alleviation without looking at the sectoral impacts. However, the agricultural sector is a major contributor to the growth of the economy of most countries in sub-Saharan Africa and faces significant credit constraints.

Given that remittances could relax the credit constraints faced by agricultural households, the study sought to examine whether remittance flow to sub-Saharan Africa provides resources for agricultural development by assessing the impacts of remittances on agricultural productivity and welfare among agricultural households in The Gambia, Ghana, and Nigeria.

The study was structured into three standalone empirical papers to answer the research questions for the study.

Specifically, the study was to (a) assess the impact of remittances on agricultural productivity in Ghana; (b) examine whether heterogeneity in economic activity of farming households affects the effects of remittances on the productivity of tradable and non-tradable crop farming households in Ghana; (c) assess the impact of remittances on agricultural household welfare in The Gambia; (d) identify the impact of remittances on welfare along the distribution of household consumption and (e) examine the relationship between remittances and household expected poverty.

When used as independent variables, remittances could potentially be endogenous in the models. Therefore, correcting for endogeneity during estimations is important to avoid possible biases in the estimated parameters. The study employed appropriate estimation methods to correct for endogeneity in all three papers. As a result, the study presents robust and consistent estimated parameters by controlling for endogeneity in the estimation procedure.

The first paper examined the effects of remittances on agricultural productivity in Ghana and found that the impact of remittance on agriculture productivity is not conclusive, suggesting a need to generate evidence to assess the impact with new data and different geographic areas.

The most recent data from the Ghana Living Standard Survey (7th round) was used to assess this relationship. To achieve this objective the propensity score matching estimator was used to control selection bias to analyse the effects of remittances on agricultural productivity. It further assessed whether heterogeneity in economic activity of farming households has an impact on the effects of remittances on the productivity of tradable and non-tradable crop farming households in Ghana. We found that the involvement of farming households in other economic activities alters the impact of remittances on crop yield. This differential impact also varies according to whether the crop is tradeable or not.

The second paper answered the question: What is the distributional effect of remittances on household welfare in The Gambia? We examined this question using the instrumental variable quantile regression approach to estimate the distributional welfare effect of remittances in The Gambia using the Gambia third Integrated Household Survey (IHS). After instrumenting for the endogenous remittance variable in the model and controlling for household demographic characteristics, the paper found that the effects of remittance on household welfare were positive and significant; however, not uniform across the income quantiles. If remittances had welfare implications, then they should cushion households against future poverty.

The third paper estimated the impact of remittances on vulnerability to expected poverty amongst agricultural households in The Gambia, Ghana, and Nigeria. We found that households that benefitted from remittances in all three countries could be smoothing consumption to reduce their vulnerability to expected poverty and therefore guard against future poverty.

6.2 SUMMARY OF FINDINGS

The study provides key insights on the overall effects of remittance receipt on the productivity and welfare of agricultural households in sub-Saharan Africa.

The findings from Chapter 3 revealed an inverse relationship between remittance and agricultural productivity. The results showed significant negative impact of access to remittance on maize and cocoa productivity of the farming households in the sample. In addition, it was found that the negative effect of remittances on productivity was stronger on tradable crops than on non-tradable crops.

Furthermore, the findings revealed when cocoa farmers with remittances switched into other economic activities, those remittances did not make a difference to the yield.

For maize farmers receiving remittances, remittances as a non-labour source of income resulted in a switch of labour away from maize thereby reducing yield. Maize is amongst the unproductive crops in Ghana with less than 50% of its potential yield, therefore may become unattractive for a remittance receiving farmer who uses the remittance to switch into other crops and/or non-farm economic activities other than maize production.

These results confirm that remittances affect yield differently for farming households and depend on the crop type and the farmer's involvement in secondary economic activities.

Findings from Chapter 4 indicated that the effects of remittance on household welfare were significant at all levels of the quantile distribution, but not uniform across the quantiles, as richer households receiving remittances had greater welfare impacts than poorer households receiving remittances. We found that large household size and high dependency ratio reduced household welfare at all the quantiles within the sample, and the effect of household size on household welfare were even at all quantiles. Even though remittances had a higher welfare impact on rich households, the impact of 9.64% increase in welfare of low-income household was substantial. This suggests the possibility that remittances can be an enabling channel for low-income households to migrate to middle income status.

Finally, the findings from Chapter 5 showed that receipt of remittances reduce the vulnerability of agricultural households to expected poverty in all three countries: Ghana,

The Gambia, and Nigeria. The findings further revealed that although urban households were less vulnerable than rural households to expected poverty, rural households that received remittances became less vulnerable to expected poverty. This underscores the importance of remittances in enhancing the welfare of rural poor households.

The overall findings from the three empirical papers support the altruistic motives of migrants to send remittances back home for the welfare of the family. The combined evidence from this study shows that remittances are important in enhancing the current welfare and reducing expected poverty of agricultural households.

6.3 RESEARCH CONTRIBUTION

This study makes 3 major contributions to the literature.

Firstly, by examining whether the effect of remittances on agricultural productivity vary by the nature of crop production; major exporting crops versus food/non exporting crops. The innovation in this study was to disaggregate the effect on productivity based on the tradability of the crop: using maize, cassava (non-tradable) and cocoa (tradable) producing households.

Furthermore, the available literature does not provide evidence on how heterogeneity in economic activity of farming households influences the effects of remittances on crop productivity. The study makes significant contribution by controlling for the heterogenous effects and conditions, like crop type, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities to explain the effect of remittances on agricultural productivity.

Secondly, a major limitation to most of the existing studies on the effect of remittances on welfare is the assumption that the effect of remittance along the distribution of household consumption is the same (Keho, 2017). Bang et al. (2016) notes that there is less consensus regarding the extent to which remittances impacts the most vulnerable population of the recipient country.

This study makes a significant contribution to literature by estimating the distributional welfare effects of remittances on household welfare in The Gambia, a country with high remittance flow and high poverty and where relatively little is known about the impact

of remittance on poverty. The understanding of the effects of remittances on different segment of income distribution of the population, especially the lower tail, helps to explain the distributional benefits of remittance than using the mean income levels of a population. In this study we show that domestic remittances have no significant effect on welfare whilst remittances of international origin positively increase welfare of agricultural households but with the relatively richer households benefitting more.

Thirdly, studies on vulnerability in Africa have focused mainly on the general population while farming households who are at risk to income fluctuations have not been studied in depth (Adams & Page, 2005; Adams & Cuecuecha, 2010; Bogale, 2012; McCarthy et al., 2016). Few studies such as Oni and Yusuf (2008), and Bogale (2012) examined the determinants of vulnerability at the rural households, however they did not explore the effects of remittances on vulnerability.

This study then contributes to the literature by assessing the effects of remittances on the vulnerability to expected poverty of agricultural households, and did cross country comparison for Ghana, The Gambia and Nigeria. Several studies have also examined the food security situations of farming and rural households (Bogale, 2012). It must be noted that food security status is a static measure, therefore a household may be food secured at a particular time, but can be food insecure any time in the future. This dynamic behaviour of consumption in the future can be better understood by assessing the vulnerability to future consumption of households, and in that respect the study makes an important contribution to the existing knowledge.

6.4 CONCLUSION

The combined evidence reveals that remittances provide non-labour income that helps to improve the welfare of agricultural households, and reduce both poverty levels and the vulnerability of agricultural households to expected poverty. These positive effects of remittances are more pronounced on poorer households. Since agricultural households are generally among the poor and vulnerable population in SSA, the study provides evidence that remittance is an indispensable tool to reduce poverty and the vulnerability to poverty among the poorest of the poor.

6.5 RECOMMENDATIONS

The results from this study offer pertinent policy recommendations necessary to increase remittance flow to sub-Saharan African countries towards increasing agricultural productivity and improving the household welfare of agricultural households. Accordingly, the study makes the following recommendations:

Firstly, the findings from the study indicated that receipt of remittance did not result in increased productivity of the crops under cultivation. This provides insight into the possible allocation of remittances among non-farm activities by the remittance receiving agricultural households. The study recommends that policymakers should pay attention to removing all obstacles that may prevent remittance recipient agricultural households from investing in agriculture. In addition, public and private extension service providers should include financial literacy modules in the farmer training modules to increase farmers' knowledge on investment of remittance in agricultural production.

Secondly, in view of the fact that cost of sending remittances to sub-Saharan Africa is the highest in the world, as established in Chapter 2, and for households to benefit more from remittances, governments in sub-Saharan Africa must put in place policies that ensure a reduction in the cost of sending remittances, especially to rural farming households to ensure increased remittance flow as an indirect way of reducing vulnerability to expected poverty. Some of the measures could include reduction in taxes on money transfer services in sub-Saharan Africa. Special bilateral or economic block agreements should be negotiated by governments of sub-Saharan Africa with countries or economic blocks that are recognised as main destinations of their migrants to enable migrants to remit money without paying transfer fees more than once. The cost saving from such reduction in transfer charges can substantially benefit poorer households who receive remittances.

For longer term impacts, efforts should be made at promoting financial inclusion to bring remittance recipient households into the formal financial sector. The study recommends that governments must promote policies aimed at encouraging financial institutions to design innovative financial products and incentive packages that will motivate migrants to remit home using formal channels for remittances.

Finally, the study recommends that governments in sub-Saharan Africa must promote a stable macroeconomic environment aimed at stabilizing exchange rates and controlling

inflation. With stable exchange rates and stable domestic prices, migrants can easily plan their remittance flow which in turn will ensure steady flow of remittances to sub-Saharan Africa.

In terms of theory, the study found that controlling for the heterogenous effects and conditions, like crop type, number of crops under farming and the engagement of smallholder farmers in non-farm enterprise activities affects the effect of remittances on agricultural productivity, we therefore recommend that heterogeneity in economic activity of the household should be controlled for when assessing the impact of remittances on household outcomes.

6.6 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The present study has limitations that present an opportunity for further research.

The first limitation to the study is the lack of panel data to investigate the impact of remittances on the agricultural households in sub-Saharan Africa. While the study corrects for potential estimation bias by using instrumental variable estimation and propensity score matching procedure in the analysis with cross-sectional data, an extensive panel data across the countries will be very useful in developing the understanding of the dynamics of the impacts of remittances on welfare and productivities of agricultural households in sub-Saharan Africa.

Panel data includes repeated observations or respondents over two or more time periods, which makes it easier to capture time-invariant unobserved characteristics of a household. Again, panel data usually contains more degrees of freedom and more sample variability than cross-sectional data, thus panel data has stronger trend prediction capabilities. The use of panel data may also allow the application of other impact evaluation methods such as difference-in-difference to estimate the “before” and “after” effects of remittance receipt on household welfare and productivity. Further research should design surveys that can collect data to unravel this dynamic impact of remittances on households to make useful contributions to literature.

Another important aspect of remittances that could be explored by further studies is to examine the impact of cost of transmitting remittances from sources countries to recipient countries. In recent years, the surge of innovative money transfer products is becoming

accessible to rural dwellers. Future research could examine how the receipt of remittances through these innovative money transfer products are promoting financial inclusion among the rural households.

The present study assumed that remittances are always used at the discretion of the recipient which might not always be true because the literature suggests that remittances may sometimes be exclusively used for repayment of the debt when migration is debt-financed. However, the data used for the study does not include the purpose for which the sender indicated the remittance to be used, hence future studies should include the motivation for sending the remittance.

In the present study, remittance is measured as a dummy to reduce the measurement error usually associated with households unable to precisely recall the number of remittances received over the survey reference period. The introduction of remittances as a dummy is however a limitation of the study because such an approach would prevent the analysis from identifying the quantity effect.

While the study sheds light on uneven distribution of benefits of remittance at all levels of the quantile distribution in The Gambia, additional research is required to confirm if the uneven distribution of benefits of remittances are increasing income inequality in The Gambia.

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APPENDICES

Appendix 6A: Ethical clearance letter



**Stellenbosch
Business School**

12 July 2022

Dear Mark

Re: Ethical screening: Mark Fghan - Exempt (USR-2022-24601)

US ID No :
Research programme : PhD In Development Finance
Title : Essays on remittances, welfare and productivity of agricultural households in Sub-Saharan Africa
Supervisor : Prof Charles Adjasi

The Departmental Ethics Screening Committee of the University of Stellenbosch Business School (USR DFSC) reviewed your application for the above-mentioned research. The research as set out in the application is confirmed as exempt from ethical clearance.

You as researcher are obliged to maintain the ethical integrity of your research. As such, you should adhere to the ethical guidelines of Stellenbosch University and remain within the scope of your ethical clearance application and the supporting evidence submitted to the USB DESC. Should any aspect of your research change from the information as presented to the USB DESC, you are under the obligation to report it immediately to your supervisor. Should there be any uncertainty in this regard, consult with the USR DFSC.

Please note that this approval may still be subject to ratification by the Stellenbosch University Research Ethics Committee. For more information on this ratification, please contact Clarissa Roberboom at cgraham@sun.ac.za.

We wish you success with your research and trust that it will make a positive contribution to the quest for knowledge at the USB and Stellenbosch University.

Should any research subject, participating organisation or person affected by this research have any questions about the research, feel free to contact any of the following:

Researcher :
Supervisor :

Yours sincerely

Chair: Stellenbosch Business School REC



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