

Doctoral Dissertation

An Assessment of the Conditional Impact of
Remittances on Formal Entrepreneurship, Poverty, and
Income Inequality in Developing Countries

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Declaration

I declare that the contents of this dissertation are my original work and have not been submitted for the award of a doctoral degree at another university. Furthermore, I confirm that all necessary materials consulted during the writing of this dissertation have been appropriately cited. In cases where co-authors have contributed to any article whose contents were used herein, I obtained permission from the co-authors. Any remaining errors are my sole responsibility.

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Abstract

Despite the scholarly debates on the impact of remittances on development outcomes, extant studies have grossly neglected the potential role of e-government, the complementarity between remittances and financial development, and labor supply decisions in inducing remittance-led development in developing countries. This thesis examines the impact of international remittances on entrepreneurship, poverty, and income inequality in developing countries, conditional on e-government development, financial development, and labor supply decisions among remittance recipients. By analyzing data from micro and macro sources and applying various panel and cross-sectional estimation techniques, the findings of the study consistently suggest that remittances can be an effective means of financing development, but with certain caveats. This study demonstrates that the positive development effects of remittances on entrepreneurship, poverty, and income inequality are attainable in countries that invest in developing their e-government architecture and directing them towards diaspora engagement. Furthermore, developing countries with better financial development are better positioned to use remittances for developmental purposes, making domestic financial institutions essential for mobilizing savings from migrants and routing them to development areas. This thesis also provides evidence of an occupational shift from agricultural to non-agricultural employment opportunities in Nigeria, resulting in entrepreneurship development, particularly in the informal sector. These findings contribute to the literature by providing a nuanced understanding of the developmental impact of remittances contingent on e-government and financial development, and identifying important policy implications that can help enhance the benefits of remittances for development. This study recommends that migrant-sending countries establish digital platforms where migrants can serve as angel investors in formal enterprises to defray the inadequacy of venture capitalists in developing countries, implement special savings interest rates to incentivize migrants to save in domestic financial institutions, and promote remittance-financed small- and medium-scale non-farm enterprises by recognizing the creditworthiness of remittance recipients and providing them with access to formal banking credit for investment and enterprise expansion.

Keywords: International remittances, e-government, financial development, financial inclusion, poverty, income inequality, entrepreneurship, labor supply, formal and informal sector, developing countries, Nigeria

JEL Classification Code: F24, J22, J24, L86, L26, M13, D23

Chapter 1: Introduction

1.1 Background to the Study

At the core of the economic growth and development agenda in developing countries are the implicit goals of alleviating poverty, reducing income inequality, and improving the general welfare of the people. Given their importance to security and the sustenance of life, poverty and income inequality have been enshrined as integral targets of the United Nations through the 2030 Sustainable Development Goals (SDGs) agenda (United Nations, 2016). Accordingly, considerable progress had been made before the COVID-19 pandemic in reducing global poverty by 25% between 1990 and 2017 (World Bank, 2016) and income inequality from 57% in 1980 to 32% in 2020 (Chancel et al., 2022). However, the COVID-19 pandemic had tremendous effects, almost reversing the progress made in reducing global poverty and income inequality, with over 80 million people (*the new poor*) estimated to fall below the poverty line (World Bank, 2020). Interestingly, more than half of the world's poor population now lives in middle-income countries (Page & Pande, 2018) with expanding within-country income inequality (Pande & Enevoldsen, 2021). Lastly, the income and wealth gaps between the top 10% and the bottom 50% have remained wide at about 43.5 and 74 percentage points, respectively (Chancel et al., 2022). These alarming indicators, therefore, require investigation into potential mitigating factors, especially in developing countries where poverty and income inequality are prevalent.

Addressing poverty and inequality in developing countries requires the provision of decent and inclusive jobs through entrepreneurship development, among other measures. Entrepreneurship is often considered the bedrock of innovation, employment creation (Amorós et al., 2019; Backman, 2015; Block et al., 2015), competition, and economic growth (Acs, 2006). However, successful entrepreneurship development relies on the extent of the support system available to both early stage and established entrepreneurs, and the forms of entrepreneurial ventures established, whether formal or informal (Omri, 2020; Wei, 2022). Recently, data from the World Bank show that several developing countries have witnessed increases in new formal businesses that are capable of providing large-scale, decent, and inclusive jobs.¹ Regardless, a perpetual hindrance to entrepreneurship

¹ Figure A1.1 shows the number and density of new businesses in 79 developing countries from 2010 to 2020. As shown in the figure, the average number of annually registered limited liability companies has increased

development, poverty alleviation, and income inequality reduction in developing countries has been inadequate financing (Yay et al., 2018), which precludes the birth of new viable ventures and the survival of existing ones. Owens and Wilhelm (2017) report that about 220 million SMEs in developing countries face credit constraints of US\$2.6 trillion. This constraint is exacerbated by inadequate financial inclusion that limits access to formal bank credit in developing countries where available (Ajide, 2020; Fareed et al., 2017). Similarly, Sachs et al. (2022) note that the slow achievement of the SDGs is mainly due to underfinancing, hence the lingering poverty and income inequality challenges in developing countries.

In the quest for alternative financing sources, academics and policymakers have continuously made a case for international migrants' remittances to meet the financial needs of developing countries. The arguments for remittances stem from the increasing size and flow stability of migrants' financial transfers to their home countries. Globally, international remittances have maintained an impressive upward trend over the years, increasing by approximately 270% between 2000 and 2010 (Habib, 2022), exceeding 5% of the GDP in several countries by 2015 (Chami et al., 2018), and reaching US\$719 billion in 2019 (International Organization for Migration, 2019; Ratha et al., 2020). Since 2016, remittances have dominated the list of external finance sent to low- and middle-income countries (LMICs), excluding China (Ratha et al., 2022). Furthermore, transfers to LMICs have increased from US\$454 billion in 2015 to US\$605 billion in 2021 and are projected to reach US\$659 in 2023², suggesting their potential development effect.

Despite the increasing scholarly attempts to link such remittances to several development outcomes, theoretical and empirical submissions have remained divergent on whether remittances could advance or mar economic growth, entrepreneurship development, poverty alleviation, and income inequality reduction in receiving countries. Recent cross-country studies (Cummings et al., 2019; El Hamma, 2018; Inoue, 2018; Martinez et al., 2015; Sobiech, 2019; Vaaler, 2013; Yavuz & Bahadir, 2021) contend that inducing remittance-led development may depend on certain conditions in migrants' host and home

from about 15,000 in 2010 to 40,000 in 2020, while the density of these businesses per 1000 adult population has increased from 1.6 to 2.6 between 2010 and 2020 (World Bank, 2021a). The increasing trend may be partly explained by the improvements in the business environments in developing countries (Klapper & Love, 2012).² Figure A1.2 shows that remittances increased from \$146 billion in 2006 to \$367 billion in 2019 and about \$46 billion higher than FDI in 2018 for some 79 developing countries used in this study. Furthermore, there are differences in remittance receipt across regions, as portrayed in panel (b) for 2019.

countries, such as diaspora concentration, financial development, ethnic diversity, shadow economy, and migration duration. While this strand of research is relatively new and expanding, it has so far ignored the potential role of digital government infrastructure (e-government) and considered remittances as substitutes for the financial sector in migrants' home countries. However, while e-government – the adoption of information and communication technologies to augment governance process – has been instrumental in connecting migrants with government agencies for home-country development collaboration, the financial sectors in migrant-sending countries are becoming better routes for mobilizing migrants' savings and channeling them towards development avenues such as entrepreneurship.

Thus, the underlying research question is whether e-government and financial development can facilitate remittance-based formal entrepreneurship in developing countries. If this conditional effect holds, it becomes imperative to ask whether developing countries could exploit advancements in e-government and financial inclusion (an aspect of financial development) to achieve the longstanding goal of alleviating poverty and reducing income inequality with remittances. These questions underscore the objectives of this study.

1.2 Justification for the Study

There are ongoing scholarly debates on the effectiveness of remittances in affecting poverty, inequality, and entrepreneurship under competing theoretical views. For instance, submissions from extant studies have been inconclusive regarding entrepreneurship development. At both the micro and macro levels, empirical submissions on the impact of remittances on entrepreneurship development have been either optimistic (Kakhkharov, 2019; Lucas & Stark, 1985; Massey & Parrado, 1998; Yang, 2008) or pessimistic (Ajide & Osinubi, 2020; Kharel et al., 2022; Zheng & Musteen, 2018). However, Kakhkharov (2019) argues that remittances encourage entrepreneurship startups conditional on sufficient household savings to supplement remittance inflows. His argument suggests that inducing remittance-based entrepreneurship may depend on certain conditions in migrants' host and home countries. Recent studies have focused on understanding the conditions that influence or moderate the remittance-entrepreneurship relationship in developing countries. For instance, studies have mentioned diaspora concentration (Vaaler, 2013), the extent of ethnic diversity (Yavuz & Bahadir, 2021), and the extent of informal economic practices (Martinez

et al., 2015) as conditions that modulate the impact of remittances on entrepreneurship. Other studies argue that the effect of remittances also depends on the type of entrepreneurship considered. For instance, Zheng and Musteen (2018) show that remittances have inverse and positive impacts on opportunity- and necessity-driven entrepreneurship, respectively.

Similarly, the literature on the impact of remittances on poverty and income inequality has grown over time, with inconclusive submissions. On the one hand, the submissions of Combes and Ebeke (2011) and Mondal and Khanam (2018) support the argument that remittances smoothen household consumption and result in poverty decline among recipients. On the other hand, Adams (1989) and Song et al. (2021) contend that remittances only raise the income of households with migrants, thereby expanding within-country inequality. The conflicting evidence on the remittance-poverty-inequality links partly stems from studying the direct effect of remittances on poverty and inequality while ignoring the important characteristics of migrant-sending countries that may influence the effect of remittances on poverty and income inequality.

Thus, a common limitation of the extant studies is ignoring some critical conditions of migrant-sending countries that could moderate the effect of remittances on entrepreneurship, poverty, and income inequality. In recent years, digital infrastructure, such as websites and virtual systems (e-government), has been crucial for providing migrants with numerous services related to business establishments by the governments of migrant-sending countries (Tittel-Mosser, 2021a). However, to the best of my knowledge, despite the growing literature on remittances and entrepreneurship, the role of digital government infrastructure (e-government) development in migrants' home countries as a condition for inducing remittance-based entrepreneurship and reducing poverty and income inequality has not been empirically investigated.

Second, despite poor savings mobilization (Gocer et al., 2016), there is increasing evidence of financial development in developing countries, partly due to globalization.³ Similarly, developing countries have made efforts to deepen their financial inclusion to provide access to formal financial services, such as credit and savings channels, to the poor, mostly women. In the existing literature, there is no evidence of how domestic financial

³ See Figure A1.3 of the appendix for a graph of the investment gap and financial development in developing countries.

development and inclusion can facilitate the effect of remittances on entrepreneurship development, poverty, and income equality. Thus, this study aims to bridge this empirical gap by studying how e-government and financial development could affect how remittances promote formal entrepreneurship development, and how e-government and financial inclusion could alter the connection between remittances, poverty, and income inequality in developing countries.

Another equally important debate in the literature from the micro-level perspective is that remittances also come with the risk of moral hazard and the expansion of reservation wages, thus reducing labor supply among recipients (Cox-Edwards & Rodríguez-Oreggia, 2009). However, because they also alleviate credit constraints (Lucas & Stark, 1985), remittances can affect entrepreneurship development through an increased labor supply to household enterprises. Empirical attempts to connect remittances to labor supply have resulted in opposite conclusions (Ademe Ayalew & Mohanty, 2022; Amuedo-Dorantes & Pozo, 2012; Borja, 2013; Dey, 2022; Khan & Valatheeswaran, 2016; Murakami et al., 2021; Nwokoye et al., 2020; Taylor & Lopez-Feldman, 2010). Thus, this study contributes to this debate by linking remittances to entrepreneurship through labor supply in a developing country such as Nigeria, where such evidence is scant and inconclusive.

1.3 Objectives and Purpose of the Study

Sequel to the preceding introductory remarks, this study aims to investigate the conditions under which migrants' remittances can facilitate formal entrepreneurship development, poverty alleviation, and income inequality reduction in developing countries. The investigation of this broad objective is disaggregated into more specific and focused objectives as follows:

1. To investigate the effect of remittances on formal entrepreneurship development conditional on e-government and financial development in developing countries.
2. To assess the need for government and financial sector involvement in facilitating remittance-induced reductions in poverty and income inequality in developing countries.
3. To investigate the effect of remittances on labor supply and its implications on entrepreneurship development in developing countries such as Nigeria.

1.4 Summary of Findings and Contributions of the Study

The preceding study objectives are investigated using both cross-country and cross-sectional datasets. The findings of Chapters 4 and 5 show that, on their own, remittances have no robust relationship with formal entrepreneurship in developing countries. However, when remittances are aided by e-government and financial development, they promote new formal enterprises and start-ups. This means that remittance-based formal entrepreneurship can be established in countries with improved e-government platforms and financial institution development. Second, the findings also indicate that while remittances improve the welfare of recipients and reduce the overall extreme poverty headcount ratio, they also lead to a widening of within-country income inequality. However, when governments in developing countries act effectively using e-government and financial inclusion strategies, they not only intensify the poverty-reducing effect of remittances, but also reduce income inequality among remittance recipients and non-recipients.

The findings in Chapter 6 indicate that remittances promote entrepreneurship in Nigeria through an occupational shift from agricultural to non-agricultural engagements. Nigerians in remittance households tend to reduce the labor supply to agriculture, but increase the hours worked in paid jobs and self-employed enterprises. The latter case invariably increases the performance of household enterprises as measured by enterprise revenue.

These findings make important contributions to different stands of literature. First, the findings fit into a group of studies that investigate the conditional effect of remittances on entrepreneurship development in migrant-sending countries. However, this study evades the gross neglect of the role of government in the literature by introducing diaspora-focused digital governance and financial development as essential conditions for remittance-based formal entrepreneurship. Second, the findings of the study also contribute to addressing the debate on how remittances can be marshalled to meet SDG targets of no poverty and reduced income inequality by providing prima facie evidence of the unique roles of e-government and financial inclusion. Third, the study on Nigeria also contributes to the literature on labor supply and non-labor income by providing evidence of the conditional effect of remittances on labor supply to different occupations. Furthermore, this study contributes by linking labor supply to enterprise performance in remittance households in Nigeria.

1.5 Organization of Chapters

In addressing the objectives of the study, the remainder of this thesis is organized into multiple chapters. Sequel to the Introduction, Chapter 2 conducts a detailed literature review to identify the gaps in the literature that buttress the relevance of the study's objectives. As a corollary of the arguments developed in Chapter 2, Chapter 3 presents and discusses the empirical model specifications, identification strategies, and data sources to meet each objective of the study. Here, measurements of the variables are discussed in detail.

Chapters 4 through 6 present the empirical results. Specifically, Chapter 4 presents and discusses the empirical findings related to the first objective of the study. Chapter 5 discusses evidence of the conditional effect of remittances on poverty and income inequality in developing countries. Chapter 6 is divided into two sections: Section 6.2 presents some stylized facts about Nigeria's labor market, migration trends, and remittances. Section 6.3 discusses the empirical findings on the connection between remittances, labor supply, and household entrepreneurship in Nigeria. Lastly, Chapter 7 presents the study's concluding remarks, including its limitations and directions for future studies.

Chapter 2: Theoretical and Empirical Literature Review

2.1 Introduction

This chapter presents an overall literature review and is divided into subsections. Section 2.2 discusses the theoretical and empirical links between international remittances and socioeconomic development, focusing on poverty and income inequality reduction. Section 2.3 reviews and identifies gaps in the general discussions on remittance-entrepreneurship literature and the specific conditionalities that foster the use of remittances for entrepreneurship development in developing countries. Following the research gap, Section 2.4 develops new theoretical insights on the effect of remittances on formal entrepreneurship, poverty, and income inequality, conditional on e-government and financial development in developing countries. Finally, Section 2.5 focuses on the link between remittances and entrepreneurship from a labor supply perspective at the micro level.

2.2 Socioeconomic Impact of Remittances - Theoretical and Empirical Studies

The evolution of theoretical perspectives on the migration-remittance-development nexus traces back to the developmentalists' or optimists' views in the 1950s and the 60s, which recognize migration as a means towards capital transfers to and investments in developing countries (de Haas, 2010). During this era, developing countries' development plans actively utilized emigration yields – remittances, experiences, and the skills of return migrants – to jumpstart their economies. From the 1970s to the late 80s, studies on migration and remittances from structuralists were generally pessimistic. The structuralists viewed migration and remittances as encouraging brain drain (Adams, 1969), remittance-dependency, and exacerbating inequalities within communities since only households with migrants are likely to receive remittances, other things being equal. Thus, the pessimistic view did not see remittances as sizeable enough to sustain improved household welfare or offset the costs of brain drain. However, a theoretical view emerged as the new economics of labor migration (NELM) in the 1980s to contend with the dichotomous and rigid views of developmentalists and structuralists (de Haas, 2010).

The NELM theory views remittances as the outcome of a household strategy to diversify its income and insure against risks by sending some members out as migrants (Lucas & Stark, 1985; Stark, 1980, 1978; Stark & Bloom, 1985). Here, migration and

remittances are theorized to have positive or negative developmental effects in migrant sending countries. The theory further stresses that the motives for sending remittances are embedded in altruism – migrants’ genuine concern for the welfare of their families – such as countercyclical transfers to smoothen consumption during periods of economic downturn (Combes & Ebeke, 2011; Mondal & Khanam, 2018) and self-interest – migrants’ motives devoid of altruistic concerns – such as remitting to inherit later, invest, or in preparations for return migration (Lucas & Stark, 1985). According to de Haas (2010), this subtle view has "revitalized academic thinking" on migration and remittances and triggered scholarly interest in the causes and effects of migration and remittances in developing countries. Accordingly, the NELM has been central to most studies on remittances during the past four decades.

From an empirical perspective, academics often debate the effects of remittances on the socioeconomic development of recipient countries. For instance, while Chami et al. (2005) argue that remittances slow economic growth through a brain drain channel, Barajas et al. (2009) find no significant effect on growth. On the other hand, Cazachevici et al. (2020) find a marginally positive effect of remittances on growth, especially in Asia. Similarly, Azizi (2018) and Petreski et al. (2018) contend that remittances increase human capital development through education and health expenditure. However, several studies argue that remittances also trigger a moral hazard and income effect, which reduces labor force participation (Ademe Ayalew & Mohanty, 2022; Asiedu & Chimbar, 2020; Dey, 2022). As a result, the improved human capital could eventually become dormant due to the dependency on remittances.

Another contention is that, while remittances often lead to improved household welfare and reduced poverty, they also raise income inequality in certain contexts. As they are often used for consumption expenditures (Ajefu & Ogebe, 2021), their effects on poverty reduction tend to be positive (Vacaflores, 2018). For instance, a study in Ghana shows that receiving remittances reduces the likelihood of being in poverty (Koomson et al., 2020). In contrast, Acheampong et al. (2021) submit that remittances are associated with increased poverty among the working-age population in sub-Saharan Africa, especially those aged 15–24 years. However, Vacaflores (2018) contends that the poverty-expanding effect of remittances only affects the moderately poor (\$2.5 to \$4) in Latin American countries. These

arguments indicate a lack of scholarly consensus on the effects of remittances on poverty reduction.

Similarly, the effect of remittances on income inequality remains contested and polarized. On the one hand, theoretical and empirical submissions suggest that remittances lead to increased income inequality in recipient countries (Koechlin & Leon, 2007). This is premised on the argument that remittances only augment the welfare of recipients compared to non-recipients, thereby expanding within-country inequality, which is increasingly characterizing several middle-income countries (Pande & Enevoldsen, 2021). Earlier micro-level studies in Egypt and the Philippines support the inequality-expanding effect of remittances (Adams, 1989; Rodriguez-Montemayor, 2012). Additionally, Song et al. (2021) show that remittances lead to a marginal increase in income inequality in a sample of 20 remittance-receiving countries.

On the other hand, Koechlin and Leon (2007) argue that the detrimental impact of remittances on income inequality depends on the extent of migration from a migrant-sending country. This view holds that at the early stages of migration, the first movers are often households with the means of financing the migration of a member, resulting in inequality between the left-behind households and households without migrant members or receiving remittances. However, extensive migration periods build a migration network that allows for information sharing, lower costs of migration, and assimilation of new migrants from low-income households. This phenomenon increases the home country's number of remittance recipients and reduces inequality. This view is supported by studies in 78 countries (Koechlin & Leon, 2007), Latin America (Vacaflores, 2018), and Kenya (Bang et al., 2016). Thus, these scholarly contentions leave room for further exploration of the conditions under which remittances could lead to a sustained reduction in poverty and income inequality in recipient countries.

2.3 Remittances and Entrepreneurship Development

The debate on whether remittances are used for productive investments among recipients and whether there are conditions that facilitate the productive use of remittances remains unsettled and can be categorized into pessimistic or optimistic perspectives (Naudé et al., 2017). One strand of the pessimistic literature (Airola, 2008; Amuedo-Dorantes & Pozo, 2006b; Kharel et al., 2022) observes that remittances reduce the likelihood of business

ownership, or the hours expended on such ventures, especially in developing countries. These studies contend that although remittances increase consumption expenditure on various household needs, they also increase reservation wages, discourage labor supply, and increase migration intention among left-behind household members. Another strand (Ajide & Osinubi, 2020; Zheng & Musteen, 2018) submits that remittances are negatively associated with formal entrepreneurship development. They argue that such ventures are risky, financially demanding, and skill-intensive, making it challenging for most remittance recipients to startup and maintain.

On the other hand, optimistic studies argue that migrants' remittances are transferred and used for various purposes, including business establishments, by those left behind (Kakhkharov, 2019; Massey & Parrado, 1998; Yang, 2008). Here, remittances become the measurable benefit of migration, augmenting household income streams and alleviating constraints caused by financial market inefficiencies, as predicted by the NELM (Lucas & Stark, 1985). These contradictory submissions, therefore, raise the question of whether inducing remittance-based entrepreneurship depends on certain conditions in migrants' hosts and home countries. Accordingly, recent studies theorize and submit empirical findings on the conditions that influence or moderate the remittance-entrepreneurship relationship in developing countries.

For instance, Kakhkharov (2019) argues that the effect of remittances on entrepreneurship development may be unpredictable *a priori* since investing in enterprises depends on the motives of the recipients. In his investigation of the remittance-entrepreneurship nexus in Uzbekistan, conditional on household non-remittance income, he finds that remittance-receiving households with sufficient income are more likely to invest in a family business. In other words, remittances are likely to influence entrepreneurship only when supplemented by household savings. One limitation of this study is that it focuses on informal household businesses. Such enterprises are often easy to start, but difficult to sustain in developing countries.

Recent cross-country studies argue that several conditions in migrant sending and host countries may influence the use of remittances, especially for formal entrepreneurship development. For instance, Vaaler (2013) builds on Williamson's (1975, 1985) and Coase's (1937, 1960) dimensions of Transaction Cost Economics (TCE) to theorize that (1) remittances enhance venture capital availability in developing countries because they are

less susceptible to opportunism; and (2) the proximity among migrants in their host countries is a condition and a mechanism that provides low-cost means of opportunity identification for investments in the home countries and magnifies the positive remittance-venture capital nexus. Accordingly, the empirical finding shows that diaspora concentration augments the positive impact of remittances on venture capital availability in developing countries, especially for less-educated migrants. A limitation of Vaaler (2013) is that in applying the transaction cost economic theory, he assumes that collaboration only holds among migrants in the host countries and between migrants and their trusted kin in the home countries, without clarifying the role of governments. Although the empirical model controlled for institutional factors, such as the rule of law and political rights, the government's role as a potential channel for reducing transaction costs for migrants is ignored.

Another host country condition that affects the remittance-entrepreneurship relationship is the duration of migration. Cummings et al. (2019) develop a theory based on the social identity, agency, and acculturation theories to hypothesize that the duration of migration changes the nature of migrants' connection with their home countries and affects venture funding and founding differently. They argue that migrants who stay abroad for less than a year still hold strong ties to their home countries and remit for business founding purposes in preparation for return migration. However, long-term migrants (staying beyond a year) become acculturated to their host countries (having a stronger connection to the destination than their home countries) and only remit to fund ventures for profit and social returns. Testing these hypotheses in a sample of 29 countries from 2001 to 2010, they find that short-term remittances (measured as employees' compensation) have a stronger association with new venture establishments, while long-term remittances (workers' remittances) have a stronger connection with investments in existing ventures for profit.

Yavuz and Bahadir (2021) show that ethnic diversity is an essential home country condition that increases the inflow of remittances for new business creation. Using social networks, social identity, transaction costs, and trust theories, they argue that more ethnically diverse societies will likely witness higher reliance on remittances for entrepreneurship, given the weaker inter-ethnic relations among non-migrants due to high uncertainty and risk. Their empirical investigation shows that, in countries with high ethnic diversity, remittances are increasingly associated with new businesses. Another home

country condition is the level of economic activities that fly under the radar of institutional surveillance. In this line, Martinez et al.(2015) use the institutional and transaction cost economics theories to hypothesize that high informality levels, which signal the weakness of institutions, reduce the availability of venture funding capital as it deters foreign investors. However, such a phenomenon makes migrants' remittances viable alternatives to fund productive ventures. Their empirical findings from a sample of 48 countries show that at higher levels of informality, say, beyond 46% of GDP, remittances increase the availability of venture funding capital in developing countries. The limitation of Martinez et al. (2015) is that increasing the inflow of remittances to countries with high informality could expand the informal sector since institutions are assumed to be weak. The implication is that an informal economy entails high costs to developing countries, such as tax evasion, indecent jobs, and pollution (Biswas et al., 2012; Medina & Schneider, 2019).

Lastly, Ajide and Osinubi (2020) theorize that the debate on the effectiveness of foreign aid on entrepreneurship development in developing countries could be resolved if institutions work or when remittances are used to augment aid financing in African countries. The empirical results show that remittances are negatively correlated with the development of formal entrepreneurship. This finding is supported by Zheng and Musteen (2018), who observe that remittances positively influence necessity-based entrepreneurship and negatively affect formal opportunity-based entrepreneurship. However, Ajide and Osinubi (2020) find that foreign aid positively affects entrepreneurship in Africa when augmented by remittances or institutional quality.

In summary, these studies on the conditional effect of remittances on entrepreneurship development have clear theoretical and empirical limitations that this study aims to improve. These limitations pertain to promoting the development of informal entrepreneurship (Kakhkharov, 2019; Martinez et al., 2015), limiting the role of the government (Cummings et al., 2019; Vaaler, 2013), and implicitly assuming that remittances are substitutes for the financial sectors in developing countries (Ajide & Osinubi, 2020; Yavuz & Bahadir, 2021). First, the literature on the informal economy shows the undesirable nature of informality in developing countries because of their considerable economic costs (Ohnsorge & Yu, 2021). Second, the government's direct role in fostering remittance-based entrepreneurship cannot be disregarded. Governments in developing countries are increasingly instituting agencies and ministries that liaise with migrants for

national development by taking advantage of advances in information and communication technologies (ICTs) (Tittel-Mosser, 2021a). Finally, although the new economics of labor migration (NELM) theory assumes that remittances are substitutes for poor financial development in migrant-sending countries, current realities indicate that financial institutions are crucial for promoting remittance-based entrepreneurship in developing countries.

2.4 Conditional Effect of Remittances on Entrepreneurship: New Insights

This section proposes new conditional relationships between remittances and entrepreneurship, and their extensions to poverty and income inequality, based on e-government and financial development in developing countries.

2.4.1 Remittances, E-government, and Entrepreneurship

The preceding discussions allude to the effect of remittances on entrepreneurship development, conditional on several factors in migrants' hosts and home countries. As this study highlighted, one of the limitations of extant studies is the limited role ascribed to the governments of migrant-sending countries. In contrast, this study argues that governments are strategic in linking remittances to formal entrepreneurship development when digital infrastructures, such as e-government frameworks, are adopted. E-government generally refers to a government's adoption of digital infrastructure or ICT to augment public service delivery (Ronaghan, 2002). It entails the digitalization of the public sector and has been instrumental in curbing shadow economic practices (Elbahnasawy, 2021; Haruna & Alhassan, 2022b), public sector corruption (Nam, 2018), tax evasion (Uyar et al., 2021), improving the business environment (Das & Das, 2021), and attracting foreign direct investment (Al-Sadiq, 2021). In this study, e-government refers to the use of ICT to augment diaspora engagement efforts,⁴ court migrants into diaspora direct investment in formal enterprises and raise development finance from the diaspora.

The argument of this study is grounded in the transaction cost economics (Coase, 1937, 1960; Williamson, 1975, 1985) and the institutional economics (North, 1987, 1989, 1991) theories. Generally, international remittances, for investment or otherwise, are sent to

⁴ See (Debnath, 2016; Jonkers, 2008; Rodriguez-Montemayor, 2012; Schöfberger, 2020; Tittel-Mosser, 2021a, 2021b, 2021c) for details on diaspora engagement policies, programs, and institutions.

the migrants' families or friends due to trust and kinship ties (Yavuz & Bahadir, 2021). In the institutional economics of Douglas North (1987, 1991), such intra-family transactions require little to no institutional enforcement since the likelihood of opportunistic behaviors is low, but still possible. For instance, migrants may still face an agency problem with their family members (Nyame-Asiamah et al., 2020) or fail to find trustworthy business partners, as in the case of El Salvador (ECLAC, 2020⁵).

On the other hand, migrants' attempts to transact with non-family members in their home countries may breed opportunism and raise their transaction costs of finding and investing in viable ventures. In the Williamson dimension of transaction cost economics theory, opportunism – "*self-interest seeking with guile*" – may stem from information asymmetry between the migrant and the potential non-familial partner. Following North's reasoning, the increased likelihood of opportunistic behaviors requires strong institutions for contract enforcement and raising the cost of opportunism. Thus, this study argues that through e-government, governments of migrant-sending countries can become brokers and arbitrators of remittance-financed investment in formal enterprises and secure collaboration between migrants and non-familial domestic entrepreneurs.

Furthermore, migrants' willingness to invest in formal enterprises requires access to information on viable sectors beyond which their families may be able to provide. Vaaler (2013) argues that, under the Coasian dimension of transaction cost economics theory, such information can be accessed from other migrants, given an established concentration of migrants in their host countries. Such a diaspora concentration is analogous to an economic agglomeration that allows information spillover among migrants. To Vaaler, migrant-to-migrant information transfer is vital to increasing remittances transfers for venture investment capital in developing countries. However, this study argues within the same Coasian dimension of transaction cost theory that other alternatives and potentially more reliable sources of investment opportunity information are the governments of migrant-sending countries. We argue that adopting e-government places governments and migrants within a digital economic zone, where information flows from governments to migrants in return for venture investment funding, thereby reducing transaction costs for migrants but increasing remittance-based formal entrepreneurship in developing countries.

⁵ Economic Council for Latin America and the Caribbean. <https://www.cepal.org/sites/default/files/a2020-07-22-ude-pb-challengesandopportunitiesinvestments-es-eng.pdf>

The approach just described is an augmentation of diaspora engagement initiatives and is gradually being adopted by several developing countries to court their diaspora into investing back home. Recent instances include the virtual annual diaspora investment summit by the Nigerians in Diaspora Commission (NiDCOM, 2020), the “Red de Argentinos Investigadores y Científicos en el Exterior (RAICES) network” of Argentina (Jonkers, 2008), the BaLinkBayan portal for Filipino migrants, and the Diaspora Connect platform for the Indonesian diaspora (Tittel-Mosser, 2021b). Others include the planned one-stop online platforms for the Jamaican and El Salvadorian diaspora (EGC, 2016⁶; ECLAC, 2020). Moreover, since e-government also eases the formalization of established enterprises by reducing the number of procedures, days, and business registration costs, migrants may be induced to invest and formalize their businesses in their origin countries or collaborate with domestic entrepreneurs. For instance, countries like Guinea and Togo provide quicker business creation procedures by establishing online portals for migrants (Tittel-Mosser, 2021a).

A potential shortcoming of our argument is whether governments are transparent and can be relied upon to facilitate remittances for formal entrepreneurship development. Tittel-Mosser (2021b, 2021c, 2021a) indicates that migrants' distrust of their home countries' governments may hinder them from investing back home. This distrust also draws from the classic debate on whether incompetence and lack of government transparency hinder the effectiveness of foreign aid on economic growth in developing countries (see Acemoglu et al., 2005; Burnside & Dollar, 2000, 2004; Collier & Dollar, 2004; Easterly, 2003; Easterly et al., 2003). We deem that the importance of government cannot be overlooked since it crafts and supports the path to development (Acemoglu et al., 2005) and sets the rules of the game, especially if impersonal cooperation and opportunistic tendencies are involved (North, 1989, 1991). Hence, governments are crucial in building an entrepreneurship ecosystem through digital diaspora engagement. In this case, the relevance of governments is limited to the extent to which they can provide social and public services to migrants to support remittance-based entrepreneurship development.

Furthermore, because e-government allows governments to be more inclusive, transparent, accountable, and effective in public service delivery (Elbahnasawy, 2014;

⁶ The Jamaican Economic Growth Council <https://www.slideshare.net/audleyshaw/economic-growth-council-jamaica-call-to-action>

Veiga & Rohman, 2017), it can influence migrants' investment decisions in their home countries by building trust between them and the government. Moreover, migrants' emotional attachment and patriotism partly inform their decisions to invest in the homeland, despite their initial distrust of the government (Braziel & Mannur, 2003). Therefore, the preceding discussion yields a testable part of this study's first objective, which alludes to the relevance of e-government in promoting remittance-based formal entrepreneurship in developing countries.

2.4.2 Remittances, Financial Development, and Entrepreneurship

Compelling evidence in the literature underscores the importance of financial development for enterprise start-ups, sustainability, and growth. Empirically, the evidence in this line of research is less ambiguous. Several empirical studies suggest that developing the financial sector and improving financial inclusion increases the rate of new enterprise establishment, even in the formal sector (Ajide, 2020; Bjørnskov & Foss, 2008; Fareed et al., 2017; Omri, 2020; Yay et al., 2018). However, Dutta and Sobel (2018) argue that financial development is only relevant for entrepreneurship at low levels, indicating the potential inaccessibility of credit for new entrepreneurs when the financial sector is developed. Finally, Urbano et al. (2020) use a simultaneous equation approach to show that, among other factor, financial development positively influences opportunity entrepreneurship, which leads to economic growth.

However, despite the importance of financial development for entrepreneurship, financial constraint remains a crucial hindrance to business startups and sustainability in developing countries (Beck & Demirguc-Kunt, 2006; Omri, 2020). Owens and Wilhelm (2017) report that about 220 million SMEs in developing countries face credit constraints of US\$2.6 trillion. This is exacerbated by the poor penetration of financial inclusion schemes in developing countries (Ajide, 2020; Fareed et al., 2017). To address this credit constraint, some scholars consider international remittances as alternative sources of financing entrepreneurship development in developing countries (Kakhkharov, 2019). Thus, in countries with weak financial development, remittances are assumed to play the role of financial institutions.

This study investigates whether financial development in migrant sending countries is a relevant channel through which international remittances are directed toward formal

entrepreneurship development. Theoretically, remittances and financial development can complement or substitute each other in influencing formal entrepreneurship. In a complementary channel, remittances may augment domestic savings and can be channelled to entrepreneurs through the domestic financial sector. Thus, with a well-functioning and inclusive financial system that offers access to formal low-cost credit, remittances can be directed towards viable investments (Kratou & Gazdar, 2016; Nyamongo et al., 2012). In the substitution channel, remittances function as alternative sources of financing entrepreneurship by circumventing inefficient financial systems with strict lending regulations and high costs (Giuliano & Ruiz-Arranz, 2009; Olayungbo & Quadri, 2019; Sobiech, 2019; Woodruff & Zenteno, 2007).

Empirical studies supporting the complementary impact of remittances and financial development on entrepreneurship in developing countries are sparse. Some of the closest studies in this regard include Munemo (2018) and Efobi et al. (2019). Munemo (2018) examines the link between FDI, financial development, and entrepreneurship in African countries and finds that financial development plays a vital role in improving their FDI absorptive capacity of African countries. Efobi et al. (2019) report a positive effect of the interaction between remittances and financial development on industrialization in Africa. However, neither of these studies has established a link with new formal business creation in developing countries. This study attempts to fill this empirical gap and hypothesizes that remittances and financial development are complementary in facilitating formal entrepreneurship in developing countries. Financial development is expected to attract migrants' savings to their home countries' financial institutions, increase savings from remittance recipients, and increase access to cheaper loans by domestic entrepreneurs.

2.4.3 Conditional Effect of Remittances on Poverty and Income Inequality

This subsection explores how the conditional effect of remittances through e-government and financial development extends to poverty and income inequality reductions in developing countries.

2.4.3.1 Remittances, E-government, Poverty, and Income Inequality

This subsection asks whether the moderating role of e-government in the remittance-entrepreneurship nexus extends to poverty and income inequality reduction in developing countries. Studying this moderating effect is crucial for policy design in the development of

migrant sending countries. Following the substantial literature on remittances, poverty, and income inequality discussed in Section 2.2, this study conjectures that employing e-government can magnify the effects of remittances on poverty and inequality. In countries with high e-government development, the net effect of remittances on poverty and income inequality reduction is larger. In other words, governments can use digital platforms to engage with their diaspora population to raise development finance and encourage the diaspora to invest in formal enterprises (Debnath, 2016; Tittel-Mosser, 2021a), redistribute income, and reduce both poverty and income inequality.

2.4.3.2 Remittances, Financial Inclusion, Poverty, and Income Inequality

This subsection extends the conditional role of financial development in the remittance-poverty-income inequality nexus by using financial inclusion as a proxy. Financial inclusion is generally understood as a channel towards poverty alleviation and income inequality reduction through the expansion of formal financial services to the previously unbanked and underbanked population (Demirguc-Kunt & Klapper, 2012). It has been championed as an effective strategy for empowering the poor, primarily women, in developing countries (Klapper et al., 2016). Several studies support the notion that financial inclusion provides access to formal financial services, such as saving and credit for productive investment (Omar & Inaba, 2020; Park & Mercado, 2018). An alternative argument is that financial inclusion may increase resource availability for individuals who use them unproductively. This unproductive use may limit beneficiaries' capacity for wealth accumulation and result in high indebtedness (Besley & Coate, 1995; Ganle et al., 2015).

Micro-level studies find that financial inclusion is pro-poor among Indian households (Churchill & Marisetty, 2020), rural Ghanaian women (Koomson et al., 2020), and Turkish households (Dogan et al., 2022). Seng (2020) contends that the effect of financial inclusion on increased income levels depends on users' financial literacy. At the macro level, studies using computed indexes, such as Park and Mercado (2018), Omar and Inaba (2020), and Gutiérrez-Romero and Ahamed (2021), show that financial inclusion is poverty-reducing. However, Nsiah et al. (2021) contend that the effect of financial inclusion in reducing poverty in Africa is nonlinear, such that below a threshold value of 0.36, financial inclusion reduces household consumption expenditure, while above this level, the effect becomes positive, thereby indicating a poverty-reducing effect. Furthermore, Cepparulo et al. (2017) and Aracil et al. (2022) argue that the effects of both financial

inclusion and development depend on the level of institutional quality in developing countries. In contrast, Ullah et al. (2021) find that financial development increases poverty and income inequality in 64 countries under the One Road One Belt initiative, while Dimova and Adebowale (2017) find evidence suggesting that financial inclusion (access to finance) tends to increase income inequality in Nigeria.

Studies on the role of financial inclusion in facilitating the effect of remittances on poverty and income inequality are generally missing in the literature, with the notable exceptions of Inoue (2018) and Ofori et al. (2022). Inoue (2018) finds that remittances and financial development have direct effects on poverty reduction while their interaction harms the poor. This finding indicates that remittances and financial development are substitutes to address poverty and make remittances less effective in countries with better financial systems. Ofori et al. (2022) present recent evidence on the detrimental effect of remittances on income inequality in 42 African economies. They find that remittances widen the income gap, even when they interact with financial development. The authors argue that such an effect could result from the poor development of African financial institutions to channel remittances towards an equitable income distribution.

We contend that the substitution effect of remittances and financial development reported by Inoue (2018) may result from measuring financial development using domestic credit to the private sector, which barely captures the inclusiveness of the financial system. To overcome this shortfall, this study uses a composite index of financial inclusion, following Park & Mercado (2018), as a proxy for financial development because the former has a direct bearing on the financial services outreach to the people and the extent to which the services are adopted. Moreover, financial inclusion eases access to formal financial services, such as lines of credit and savings, by a country's hitherto unbanked or underbanked segments (Saha & Qin, 2022). Therefore, this study predicts that remittances effectively reduce poverty and income inequality in countries with deeper financial inclusion. The intuition is that, while financial inclusion will ease remittance receipts and reduce overall poverty levels for recipients, it will also facilitate income redistribution and reduce income inequality between remittance and non-remittance households.

2.5 Remittances, Labor Supply, and Entrepreneurship in Nigeria

The preceding sections focused on the remittance-entrepreneurship and remittance-poverty-inequality links in cross-country settings. However, remittances are more likely to affect entrepreneurship development at the household and individual levels. The household- or individual-level effect is further connected to the literature on the effect of remittances on labor supply. This section discusses this strand of the literature and identifies the limitations of existing studies in the context of Nigeria. It focuses on Nigeria because of its labor market dynamics and the increasing inflow of remittances as discussed later in Chapter 6.

The neoclassical labor supply models theoretically premise the relationship between remittances and labor supply, where individuals face a labor-leisure dilemma in response to receiving non-labor income (Gronau, 1973; Killingsworth, 1983). Similarly, remittances are sources of non-labor income that increase the recipients' reservation wage and reduce the likelihood of labor supply in favor of more leisure, *ceteris paribus* (Amuedo-Dorantes & Pozo, 2012). This reduction in labor supply is referred to as the income effect of remittances (Kharel et al., 2022). On the other hand, Cox-Edwards and Rodríguez-Oreggia (2009) argue that remittances may also have a “neutral effect” as the labor supply of recipients remains unchanged. They argue that where remittances only replace the income a migrant would have contributed to the household in the absence of migration and not as additional income, the labor supply of other household members would remain unaffected.

Empirical attempts to evaluate the effect of remittances on labor supply have resulted in mixed conclusions across countries, genders, and occupational choices. For instance, Kharel et al. (2022), Murakami et al. (2021), Ademe Ayalew & Mohanty (2022), and Borja (2013) find that receiving remittances leads to lower propensity of labor supply among recipients in Nepal, Tajikistan, Ethiopia, and El Salvador, respectively. Other studies argue that due to existing gender roles in some countries, women are more likely to reduce the labor supply to market jobs in favor of household duties (Al-Assaf, 2022; Asiedu & Chimbar, 2020; Azizi, 2018; 2013; Khan & Valatheeswaran, 2016; Kharel et al., 2022). However, the conclusion of Dey (2022) contends that men are twice as likely to reduce labor force participation in general compared to women in rural India.

On the contrary, the volatility and infrequency of remittance could influence non-migrants to enter the labor force or even increase the hours worked, especially for non-farm employment (Nwokoye et al., 2020). Dey (2022) further shows that international remittances

increase labor supply for non-farm self-employment and salaried employment in rural India. In Kerala, India's highest recipient of international remittances, Khan and Valatheeswaran (2016) show that remittances perform a twin function: reducing the labor supply by increasing reservation wages and alleviating credit constraints by allowing men to pursue self-employment activities.

These occupational switches suggest that remittances increase labor supply to some extent, especially to household enterprises. For instance, the new economics of labor migration (NELM) theory (Lucas & Stark, 1985; Stark & Bloom, 1985) alludes to an increased effect of remittances on labor supply as they augment household income streams and alleviate credit constraints caused by financial market inefficiencies. Thus, receiving households are likely to use excess remittances for enterprise development, thereby increasing labor force participation and the hours worked in household enterprises. Kakhkharov (2019) argues that Uzbekistan households with sufficient income invest remittances into entrepreneurship. Similarly, several studies (Dey, 2022; Raihan et al., 2018; Vadean et al., 2019) conclude that remittances increase labor force participation in self-employment ventures and agricultural activities. However, Kharel et al. (2022) argue that due to moral hazard, Nepalese households reduce labor supply to non-farm enterprises, as is evident from the decline in enterprise revenue as remittances increase. Similarly, Amuedo-Dorantes and Pozo (2006b) find that remittances reduce the likelihood of enterprise ownership in the Dominican Republic.

Lastly, Cox-Edwards and Rodriguez-Oreggia (2009) and Dávalos et al. (2017) find that receiving remittances has no systematic effect on labor force participation in Mexico and Kyrgyzstan, respectively. They argue that recipients either maintain the same level of labor supply or increase their participation in unpaid family work to replace the lost labor caused by the migration of a household member. While previous studies mainly focused on the household or individual level, conflicting findings on the remittance-labor force participation nexus still characterize studies at the macro level (See Azizi, 2018; Posso, 2012).

In the case of Nigeria, there is scant evidence on the effect of remittances on labor force participation, with the exception to the conflicting findings by Urama et al. (2017) and Nwokoye et al. (2020). Using the second wave of the Nigerian general household survey of 2013, Urama et al. (2017) find that remittances have no significant effect on the overall

labor supply in Nigeria but discourage labor supply to agricultural activities. In contrast, Nwokoye et al. (2020) find evidence from the third wave of general household survey data of 2016 that remittances increase labor supply to non-farm economic activities, especially in urban areas, but support the negative effect on agricultural activities. Furthermore, both studies disagree on the effect of remittances on labor supply among Nigerians aged below 25 years. While Nwokoye et al. (2020) posit that younger Nigerians tend to increase their labor supply, Urama et al. (2017) show that younger Nigerians opt for increased school enrollment over labor force participation. Instead, only Nigerians between the ages of 25 and 60 increase their labor supply. Beyond the conflicting evidence from both studies, their empirical strategies are based on the propensity score matching technique, which matches treated and non-treated samples based on observable characteristics. However, both remittances and labor supply may be affected by unobserved factors at both the individual and household levels, thus requiring suitable identification techniques (Cameron & Trivedi, 2005).

Furthermore, the extant studies have largely ignored the heterogeneous effect of remittances across income levels and recipients' educational attainment. Assessing these dynamics is important, because individuals with different levels of education and socioeconomic status may have different reservation wages and respond differently to remittances. Lastly, there is currently no study in Nigeria connecting the effect of remittances on labor supply to non-farm enterprises on the performance of such enterprises. Moreover, we find no study in the literature exploring the heterogeneous effect on the formality status of household enterprises. Thus, this study aims to overcome these limitations by providing new evidence on the remittance-labor supply connection in Nigeria.

Chapter 3: Analytical Framework and Data

3.1 Introduction

This chapter discusses the model specifications and datasets required for the empirical analyses of this study and is divided into two sections. Section 3.2 develops the empirical frameworks, identification strategies, and estimation techniques to meet some of the objectives and hypotheses of the study. Broadly, the empirical frameworks highlight the direct and conditional effects of remittances on formal entrepreneurship development and their extension to poverty and income inequality reduction in 110 developing countries.⁷ Furthermore, this section discusses the measurement of key variables and data sources for the cross-country analyses. On the other hand, section 3.3 discusses the empirical framework, estimation techniques and data on remittance, labor supply, and entrepreneurship in Nigeria.

3.2 Direct and Conditional Effects of Remittances

This section presents the analytical frameworks for the cross-country investigation in three contexts: first, when e-government development is considered as a condition in migrant-sending countries for the effectiveness of remittances in advancing formal entrepreneurship development; second, when domestic financial development is evaluated as the channel towards remittance-based formal entrepreneurship; and third, when e-government and financial inclusion aid the use of migrants' remittances for poverty and income inequality reduction. We evaluate all cases in cross-country settings using the analytical frameworks explained in the following subsections.

3.2.1 Remittances, E-government, and Entrepreneurship

Chapter 2 develops a theory grounded in transaction cost economics and institutional economics theories (Coase, 1937; North, 1991; Williamson, 1975) to argue the role of the governments of migrant-sending countries in linking remittances with formal entrepreneurship. The proposed theory treats governments as agents in resolving information asymmetry and reducing migrants' transaction costs associated with finding and investing in viable business ventures in their home countries. Accordingly, governments

⁷ See Table A3.1 for the list of countries.

can effectively play this role by adopting digital infrastructure (e-government) to augment their diaspora engagement initiatives (Tittel-Mosser, 2021b, 2021c, 2021a) and increase the flow and use of remittances for formal entrepreneurship. We test this theory in a sample of 55 developing countries using biennial data between 2007 and 2019, beginning with the following empirical model:

$$\begin{aligned}
 nbd_{it} = & \beta_0 + \beta_1 rem_{it} + \beta_2 EGDI_{it} + \beta_3 (rem_{it} * EGDI_{it}) + \beta_k X_{it} + y_i C + \tau Yr \\
 & + \varepsilon_{it} \qquad (1)
 \end{aligned}$$

where nbd is the new business density in country i at time t and a proxy for formal entrepreneurship⁸; rem is remittances per capita to country i at time t ; $EGDI$ is the index of e-government in country i at time t ; X is a vector of control variables such as GDP growth rate, GDP per capita, economic globalization, financial development, government expenditure, and measures of institutional quality; C accounts for country fixed effects; Yr accounts for year FE to control for common shocks across time; $\beta_0, \beta_1, \beta_2, \beta_3, y_1$ and τ are parameters to be estimated and ε_{it} is the error term. We expect $\beta_1 > 0$ and $\beta_2 > 0$.

In Equation (1), β_3 is the coefficient of remittance-e-government interaction, the main parameter being evaluated, and is predicted to be positive. Thus, it is important for evaluating the effectiveness of e-government as a moderator in facilitating remittance-based formal entrepreneurship in developing countries. As Wooldridge (2016) notes, interpreting the direct effect of an explanatory variable on the explained is less useful or informative in the presence of an interaction term. Thus, the net effect of remittances on entrepreneurship can be derived by taking the partial derivative of Equation (1) with respect to remittances, as given below.

$$\frac{\partial(nbd_{it})}{\partial(rem_{it})} = \beta_1 + \beta_3 egov_{it} \qquad (2)$$

If $\beta_1 < 0$ and $\beta_3 > 0$, e-government development encourages the use of remittances for new business creation and overturns any negative effect of remittances, while at $\beta_1 < 0$ and $\beta_3 < 0$, e-government intensifies the negative effect of remittances.

⁸ For the rest of the study, new business creation, new business density and entrepreneurship are used interchangeably.

3.2.2 Remittances, Financial Development, and Entrepreneurship

Next, we specify the following model for a sample of 79 developing countries from 2006 to 2020 to investigate the role of financial development in channeling remittances towards formal entrepreneurship development:

$$\begin{aligned} nbd_{it} = & \gamma_0 + \gamma_1 rem_{it} + \gamma_2 FID_{it} + \gamma_3 (rem_{it} * FID_{it}) + \gamma_k X_{it} + y_i + \tau_t \\ & + e_{it} \end{aligned} \quad (3)$$

where nbd_{it} and rem_{it} remain as defined in Equation (1). FID_{it} is financial development, measured using five indicators: the financial institution development index (as the main proxy), domestic credit to the private sector, liquid liability, deposit money bank assets, and lending rate. These financial development indicators mainly measure the financial institution (such as banks) aspect of the financial sector and make no reference to financial market aspects such as the stock and bond markets⁹. X_{it} is a vector of control variables such as economic growth, GDP per capita, trade openness, government expenditure, institutional quality, unemployment rate, population growth rate, and the number of days required to start a business. y_i controls for country-specific time-invariant characteristics, whereas τ_t is the time fixed effect that controls for common shocks across countries. Lastly, e_{it} is the error term.

Equation (3) allows us to assess the partial and conditional effects of remittances on formal entrepreneurship development. Following the arguments in section 2.4.2 of Chapter 2, we expect remittances and financial development to positively influence entrepreneurship. The γ_3 in Equation (3) is the coefficient of the remittance-financial development interaction. In the case where $\gamma_3 < 0$, remittances would replace financial development if $\gamma_1 > 0$. In other words, remittances only enhance entrepreneurship development in countries with weak financial institutions. However, if $\gamma_3 > 0$, remittances and financial development complement each other in influencing entrepreneurship development even if $\gamma_1 < 0$. A negative γ_1 would only show that, holding other things equal, remittances are not used for formal entrepreneurship development in countries with weak financial systems. Thus, $\gamma_3 > 0$ would indicate that better financial development is important for directing remittances to

⁹ See Section 3.2.5 for further discussion on the choice of financial institutions instead of financial markets. Also, in Chapter 4, we present empirical findings for why financial markets in developing countries are not important for linking remittances with new business creation.

formal entrepreneurship development. Therefore, the net effect of remittances can be calculated using the partial derivative of Equation (3) with respect to remittances, as follows:

$$\frac{\partial(nbd_{it})}{\partial(rem_{it})} = \gamma_1 + \gamma_3 FID_{it} \quad (4)$$

We test the hypothesis that $\gamma_3 > 0$ for two reasons. First, remittances raise recipients' creditworthiness and are associated with financial inclusion by encouraging non-migrants to set up bank accounts. This inclusion exposes non-migrants to formal financial products and services that support formal entrepreneurship, such as loans for investment. Second, migrants' income can be transferred to their countries of origin as savings in response to certain financial benefits. Such transfers allow local financial institutions to augment domestic savings and allocate low-cost funds to investors in formal entrepreneurship.

A potential problem in estimating Equation (3) is the endogeneity of remittances and other macroeconomic variables and the possible dynamic nature of entrepreneurship. To address these concerns, we re-estimate Equation (3) using a dynamic panel data approach following previous studies (Giuliano & Ruiz-Arranz, 2009; Sobiech, 2019; Vaaler, 2013) as follows:

$$nbd_{it} = \alpha_0 + \gamma_0 nbd_{it-1} + \gamma_1 rem_{it} + \gamma_2 FID_{it} + \gamma_3 (rem_{it} * FID_{it}) + \gamma_k X_{it} + y_i + \tau_t + e_{it} \quad (5)$$

where nbd_{it-1} is the lag of the dependent variable; other variables remain as previously defined.

3.2.3 Conditional Effect of Remittances on Poverty and Income Inequality

The main goal of this subsection is to lay out an empirical framework for assessing the extended effects of e-government and financial development (proxied by financial inclusion) in moderating the remittance-poverty-income inequality relationship in developing countries. The relevance of this assessment hinges on the need to find efficient means to alleviate poverty and reduce income inequality in developing countries. Although it has been suggested that migrants' remittances have the potential to meet these goals (International Fund for Agricultural Development, 2022), empirical submissions (Section 2.2) have remained mixed, thereby necessitating further investigation. To address the scholarly debates, this study advances the existing literature by exploring the conditional

effect of remittances. To meet this objective, we specify the following linear model for poverty and income inequality:

$$y_{i,t} = \omega_0 + \omega_1 rem_{i,t} + \omega_2 X_{i,t} + \omega_3 (rem_{i,t} * X_{i,t}) + \omega_4 Z_{i,t} + v_i + \mu_t + \varepsilon_{i,t} \dots\dots(6)$$

where $y_{i,t}$ is a vector of the dependent variables: poverty headcount at \$1.90 and income inequality in country i at time t . $rem_{i,t}$ is the primary explanatory variable measured by annual per capita remittances received in country i ; $X_{i,t}$ is a vector of the secondary explanatory (moderating) variables, namely, e-government and financial inclusion. The measurements for both variables are described in the following subsections. Z is a vector of control variables drawn from the literature that affect poverty and income inequality, such as GDP growth rate, trade openness, unemployment rate, rural population, corruption, and the shadow (informal) economy. v_i, μ_t , and $\varepsilon_{i,t}$ are the country-specific fixed and time effects and the error term, respectively.

The most important parameter in Equation (6) is ω_3 , the coefficient of the interaction terms between remittances and e-government and between remittances and financial inclusion. Accordingly, ω_3 is expected to have a negative sign, indicating that remittances effectively reduce poverty and income inequality in countries with better e-government and financial inclusion. This expectation is guided by the partial derivative of Equation (6) with respect to remittances:

$$\frac{\delta(y_{i,t})}{\delta(rem_{i,t})} = \omega_1 + \omega_3 X_{i,t} \quad (7)$$

The intuition for the negative sign of ω_3 is that remittances are expected to increase the income and consumption levels of households in receiving countries, thereby reducing the general level of poverty. However, this could also result in increased income inequality, since only recipients' income levels are uplifted, other things being equal. In this instance, within-country inequality may increase, and by extension, between-country inequality can also expand. However, the development of e-government and financial inclusion allow remittance-receiving countries to steer both the inflow and usage of such transfers to productive ventures. For instance, e-government is essential for improving government-diaspora relations and increasing remittance transfers to developing countries. Such a mechanism could allow developing countries to fund development projects that benefit both migrant and nonmigrant households. Moreover, e-government makes the business environment of a country conducive (Das & Das, 2021) and limits the proliferation of the

informal economy (Elbahnasawy, 2021), allowing remittance-receiving households to easily engage in formal entrepreneurship and provide job opportunities within a country. Such entrepreneurial ventures can reduce poverty and income inequality.

Similarly, the deepening of formal financial services offers two channels for the poverty and income inequality reduction induced by remittances. First, extending financial inclusion to a larger portion of a country could ease the transfer or receipt of remittances from abroad. For recipient households, exposure to formal financial services may not only incentivize them to save the excess remittances in the banks but also afford them access to formal loans for productive investments since remittances increase their creditworthiness (Barajas et al., 2009; Osili, 2004) and signal their ability to repay loans in the future. Second, the excess remittances saved in the formal financial sector can also be accessed and used for productive investments by non-remittance-receiving households in a country. Both channels place financial inclusion as a bridge between remittance receivers and non-receivers, thereby providing opportunities for poverty and income inequality reduction.

3.2.4 Estimation Techniques and Identification Strategy

For subsections 3.2.1, the first econometric technique adopted to estimate Equation (1) is the Panel-Feasible Generalized Least Squares (FGLS). This method provides reliable estimates that are robust to first-order panel autocorrelation and panel heteroscedasticity (Ajide & Osinubi, 2020; Vaaler, 2013; Zheng & Musteen, 2018). Thus, using FGLS, the standard errors obtained are robust to common autocorrelation across panels and heteroscedasticity. However, some scholars argue that the FGLS technique produces standard errors that are biased downwards (Beck and Katz, 1995), weakening the reliability of the reported estimates. Hence, we check the robustness of the FGLS results using fixed- and random-effects estimation techniques with Driscoll–Kraay (DK) standard errors. Similarly, the DK fixed effects technique is adopted as the baseline estimator for Equation (3) in subsection 3.2.2 and Equation (6) in subsection 3.2.3. The DK technique provides standard errors that are robust to spatial and temporal cross-sectional dependence, heteroscedasticity, and autocorrelation (Hoechle, 2007; Zhang & Lin, 2012).

An econometric concern in estimating Equations (1), (3), and (6) is the potential endogeneity of remittances. Azizi (2020) and Kakhkharov (2019) note that international remittances may be endogenous for at least three reasons. First, reverse causality may be

present in models with entrepreneurship, poverty, and income inequality as outcome variables since remittances are often countercyclical (Combes & Ebeke, 2011). Thus, when income inequality and poverty are prevalent, migration and remittance transfers may increase. Second, although our model includes several control variables, the error term may still contain some variables correlated with remittances that are not captured in our analysis. Lastly, Azizi (2020) emphasizes that measurement errors exist when computing official remittances received in a country. This stems from the argument that a large portion of remittances are transferred through informal means to avoid the cost of remitting through the formal channel.

To account for the possible endogeneity of remittances, this study uses a two-step fixed effects regression using the lag of remittances as an instrument in the first-stage regression to re-estimate Equation (1) following (Asongu & Odhiambo, 2020). Similarly, to check for robustness to the potential endogeneity and the dynamic nature of business density in Equation (3), Equation (5) is estimated using the two-step system generalized method of moments (system GMM) estimation technique (Arellano & Bover, 1995; Blundell & Bond, 1998). The GMM technique allows us to use valid internal instruments in the form of the lags of the dependent and endogenous independent variables, especially in the absence of an external instrument (Roodman, 2009). Furthermore, the GMM specification includes the forward orthogonal option to retain as many observations as possible and the robust option for the (Windmeijer, 2005) finite-sample adjustment. The Windmeijer adjustment corrects for potential downward-biased standard errors in the two-step GMM estimation.

Finally, we employ the two-step fixed effects (TSFE) technique using the number of individuals with access to the internet in a country and the first lag of remittances as instruments as a robustness check for all estimations connected to Equation (6). We postulate that these instruments affect the outcome variables only through their effects on remittances per capita. Essentially, having access to the internet does not directly reduce poverty or inequality. However, such access could provide easier means of transferring remittances or facilitating migration. The lag of remittances as an instrument has also been used in the literature (Asongu & Odhiambo, 2020).

3.2.5 Measurement of Variables and Data Sources

This subsection discusses the measurement and sources of the main variables used in this study, including formal entrepreneurship, remittances, e-government development, financial development, financial inclusion, poverty, and income inequality.¹⁰

Formal Entrepreneurship: Generally, different forms of entrepreneurship affect growth differently (Amorós et al., 2019; von Bloh et al., 2020) and are motivated by distinct factors. Previous studies (Acs, 2006; Amorós et al., 2019; Schmutzler et al., 2021) distinguish between two forms of entrepreneurship based on their determinants or motivations: formal or opportunity, and informal or necessity-based entrepreneurship. The former is associated with the formal sector, innovativeness, opportunity pursuit, employment provision, wealth creation, and economic growth, especially in institutionally (financial or otherwise) supportive environments (Urbano et al., 2020; Wei, 2022). On the other hand, necessity entrepreneurship stems from the need to escape economic challenges, such as unemployment and poverty, and have a safety net for oneself (Acs, 2006; Block et al., 2015; Zheng & Musteen, 2018). This form of entrepreneurship is often associated with the informal sector (Amorós et al., 2019), which always faces constrained access to credit (Chatterjee & Turnovsky, 2018). Thus, this study focuses on formal or opportunity entrepreneurship, given its role in economic growth through innovation and employment creation. This form of entrepreneurship has grown in recent years in developing countries and calls for scholarly investigation of its possible and potential drivers.

In the context of this study, such a form of entrepreneurship is proxied by the new business density (*nbd*) from the World Bank Entrepreneurship survey dataset and used as the dependent variable for Equations (1), (3), and (5). The new business density is measured as the annual density of newly registered formal private sector companies with limited liability in a country per 1000 working age (15-64 years) population (World Bank, 2021a) and has been used by several studies, including Ajide & Osinubi (2020), Klapper & Love (2012), Nanyiti & Sseruyange (2021), and Nica (2021) to measure entrepreneurship development. The dataset is available from 2006 to 2020 for about 139 countries. However, we only used data from 81 developing countries, based on the availability of other variables.

¹⁰ See Tables A3.2, A3.3, and A3.4 of the Appendix for summaries of the data description and sources.

International Remittances: International remittances are commonly viewed as transfers made by migrants (migrant workers) in monetary or non-monetary terms to non-migrants in another country to support the latter's living conditions, settle debts, or as savings or investment capital. According to the new economics of labor migration (NELM) theory, such transfers result from household decisions to diversify their income streams and circumvent inefficient credit markets in their local economies (Lucas & Stark, 1985). Recent research (Cummings et al., 2019; Martinez et al., 2015; Vaaler, 2013) in international business considers remittances as investment finance, especially by transnational migrant entrepreneurs. However, these definitions largely depend on people's movements, and only hold to the extent that such transfers can be tracked and measured. The commonly available remittance data stems from transfers through formal channels that are trackable over time. Hence, the IMF's Balance of Payment Statistics manual considers remittances more broadly for measurement purposes to include the personal transfers of individuals – the cash or kind transfers between individuals, such as migrants and non-migrants across borders – and the compensation of employees (International Monetary Fund, 2009).

This study follows the existing literature (Naufal & Termos, 2009; Peković, 2017) by adopting a broader definition of remittances for analytical purposes and sourced the data from the World Development Indicators (World Bank, 2021c). It measures remittances as the annual per capita remittances (*rem*) received in a country in US\$, following Vaaler (2013) and Yavuz & Bahadir, (2021). The same measurement is used for all estimations in Equations (1), (3), (5), and (6) for 110 developing countries.

E-government Development: To measure e-government as a proxy for diaspora engagement, this study uses the United Nations (UN) e-government development index (EGDI), which measures how willing and capable governments of UN member nations are to adopt ICT to execute their functions and services (United Nations, 2020). It is measured on a scale of 0 to 1, with higher values indicating better development of e-government¹¹. EGDI represents a weighted average of three independent components: the online services index (OSI), which measures the extent and quality of the government's online presence; the human capital index (HCI), which measures the ability of citizens to use e-government; and the telecommunications infrastructure index (TII). The United Nations also provides a supplementary indicator of e-government, called e-participation (EPART), to measure the

¹¹ The data is available for 2003, 2004, 2005, 2008, and every two years until 2022.

extent of citizens' adoption and use of ICT to access online services from the government and participate in decision-making processes and governance (United Nations 2020). In estimating Equations (1) and (6), the overall e-government index is replaced with each of these components in different specifications to evaluate their effectiveness.

One limitation of the EGDI is that the conceptual understanding and use of the index occasionally change, especially as technologies evolve. However, such limitations allow us to propose a new e-government function beyond its traditional function of augmenting domestic public service delivery, to include an augmented diaspora engagement initiative. Lastly, for Equation (1) only, the e-government data are adjusted upward by one period to account for the delay between e-government index data generation and publication. Elbahnasawy (2014, 2021) notes that the contemporary index for a particular year is based on data from a year or two before. For example, the 2018 exercise for e-government data generation was completed in November 2017 and was published in July 2018. Hence, the 2018 index from the UN was considered the index for 2017 in our dataset.¹² However, for Equation (6), we use the e-government indicators originally published by the UN without any temporal adjustment.

Financial Development: Contextually, financial development is an umbrella concept that indicates an improvement in a country's financial institutions, markets, and instruments. Such improvements include increased mobilization of savings, efficient capital allocation, risk management and diversification, and financial stability (Svirydzenka, 2016). To measure financial development, the IMF considers improvements in the access, depth, and efficiency of financial markets and institutions. However, in this study, financial development is defined as improvements in the access to, depth, and efficiency of financial institutions, such as banks. Thus, this study adopts the IMF's financial institution development index as the primary proxy for financial development. This variable is measured on a scale of 0 to 1, with higher values indicating a better development of financial institutions. The choice of financial institutions over financial markets is based on the fact that migrants' remittances flow through institutions such as banks rather than the financial market (stock and bond markets). Furthermore, early-stage entrepreneurs in developing

¹² Similar adjustments are made for other years. Hence, the indexes for 2007, 2009, 2011, 2013, 2015, 2017, and 2019 are from a year after in the UN dataset. A similar adjustment was made in Elbahnasawy (2014, 2021).

countries mostly rely on banks as the main such of formal financing (Casanova et al., 2018) instead of the stock market.

Following previous studies (Dutta & Sobel, 2018; Kratou & Gazdar, 2016; Omri, 2020; Sobiech, 2019), this study uses four alternative measures of financial development commonly adopted in the literature and sourced from the World Bank such as the domestic credit to the private sector by banks, liquid liability (broad money), lending interest rates, and deposit money bank asset.¹³ Notably, domestic credit, liquid liability, and bank assets are measured in percentages of GDP, indicating that higher values are better indicators of financial institution development. In contrast, higher lending rates indicate higher costs of accessing loans from banks.

Financial Inclusion: To measure financial inclusion, we construct a composite index following the methodology of Park and Mercado (2018) and Sarma (2008). The index comprises six components: financial institution branches per 100,000 adults (including the number of registered mobile money outlets), automated teller machines (ATM) per 100,000 adults, deposit accounts with financial institutions per 1,000 adults, depositors in financial institutions per 1,000 adults, loan accounts with financial institutions per 1,000 adults, and borrowers from financial institutions per 1,000 adults. All variables are culled from the Financial Access Survey (FAS) of the International Monetary Fund (IMF, 2022). The first step in computing the index is to use these variables to compute a dimension index, using the following formula:

$$d_i = \frac{A_i - m_i}{M_i - m_i} \quad (8)$$

where d_i is the i th dimension or the normalized value of each of the six components of our index, A_i is the recorded value of the dimension i , m_i is the minimum recorded value of the dimension i , M_i is the maximum value of the dimension. The next step is to use the normalized dimensions to create the financial inclusion index using the formula from Park and Mercado (2018) and Sarma (2008), as shown below:

$$FI_i = 1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + (1-d_3)^2 + (1-d_4)^2 + (1-d_5)^2 + (1-d_6)^2}}{\sqrt{n}}, \quad (9)$$

where the righthand side numerator is the inverse of the Euclidean distance to point d_i , and \sqrt{n} is the square root of the number of observations. We further normalize the financial inclusion index to between 0 and 1, with higher values indicating higher financial inclusion.

¹³ The summary of all the financial development indicators is presented in Table A3.2.

We refrain from arbitrarily assigning weights to our dimensions, as in Omar and Inaba (2020), because of the missing data in the sample. However, as in Park and Mercado (2018), this index includes all available data on the components of the financial inclusion index.

Poverty and Income Inequality: Poverty is measured as the annual percentage of the population living below US\$1.90 per day and is sourced from the World Development Indicators of the World Bank (WDI-World Bank, 2022). Owing to the gaps in the poverty data, we used the linear interpolation method to fill missing values where possible. Income inequality is measured using the Gini coefficient from the United Nations World Income Inequality Database (UNU-WIID, 2022).

Other Control Variables: Throughout the study, several control variables were adopted from the existing literature and appropriately employed in various specifications, as shown in Tables A3.1–A3.3. These include GDP per capita, GDP growth rate, government expenditure, unemployment rate, economic globalization index, financial development index, trade openness as the sum of imports and exports as a percentage of GDP, number of days required to start a business, annual population growth rate, size of the informal economy, public sector corruption, percentage of rural population, and trade globalization index. The control variables are derived from the World Bank's World Development Indicators, IMF financial development database, KOF globalization index (Dreher, 2006; Gygli et al., 2019), and V-dem dataset (Coppedge et al., 2020). Lastly, institutional quality (IQ) measures, such as the protection of property rights, corruption control, regulatory quality, government effectiveness, the rule of law, political stability, and voice and accountability, are included to control for the soundness of institutions in a country. The IQ measures are sourced from the Fraiser Institute's Economic Freedom of the World dataset and the World Bank's World Governance Indicators (Kaufmann et al., 2010).

3.3 Remittances, Labor Supply, and Enterprise Performance in Nigeria

This section assesses the nexus between remittances, labor supply, and entrepreneurship in Nigeria to meet the objectives set in Section 2.5 of Chapter 2. In particular, the interest is on how remittances affect labor force participation and labor supply to three occupations: wage jobs, agriculture, and non-farm enterprises. Accordingly, wage employment is defined as working in a paid, private or public, non-farm job. Such jobs are mostly outside the household, where the individual is paid based on an agreement with the employer. Second,

agricultural work denotes working in any type of agricultural job owned by an individual. Such jobs could include crop farming, poultry farming, and livestock farming, among others, where individuals could generate income. Lastly, non-farm enterprise work refers to an individual's participation or hours worked in their own enterprises. These enterprises may include manufacturing, trade, and services.

The following models are specified to assess the effect of remittances on the probability of working and the hours worked in the three occupational choices:

$$LFP_{W,A, Ni}^* = \beta_0 + \beta_1 Rem_i + \beta_2 X_i + \varepsilon_i \quad (10)$$

$$LS_{W,A, Ni}^* = \beta_0 + \beta_1 Rem_i + \beta_2 X + \varepsilon_i \quad (11)$$

The outcome variable in Equation (10), LFP^* , is the latent variable for labor force participation (extensive margin) in the three occupations. Hence, an individual is observed to have participated in a particular work ($LFP = 1$) if $LFP_{W,A, Ni}^* > 0$ and 0 if otherwise. On the other hand, the outcome variable in Equation (11), LS^* , is the latent indicator of labor supply (the number of hours worked) in any of the three occupations. Thus, LS is observed if $LS_{W,A, Ni}^* > 0$ and 0 if otherwise. Similarly, labor supply is always observed when labor force participation equals one. The subscripts, W, A, Ni , in both Equations (10) and (11) denote labor force participation or labor supply to wage jobs (W), self-employed agriculture (A), and self-owned non-farm enterprises (N). The classification of occupations into three categories allows for a better assessment of the response of LFP and LS to remittances in Nigeria beyond the binary classification of either agricultural or non-agricultural works in Nwokoye et al. (2020).

In both Equations (10) and (11), i denotes individuals between the ages of 15 and 65; Rem represents both the remittance dummy equal to 1 if an individual lives in a household that received international transfers during a 12-month period and the actual amount of remittances received per household (in Naira). X is a vector of individual, household, and community characteristics that affect an individual's labor force participation and labor supply decisions, as presented in Table 3.1. Lastly, both Equations (10) and (11) are used to assess the direct effect of remittances on participation and hours worked for the overall sample.

3.3.1 Heterogeneous Effect Assessment

Equations (10) and (11) are also extended to consider the heterogeneous effect of remittances by subsamples of educational attainment (four categories) and household income (four quartiles). The interest here is to observe whether individuals with different levels of formal education or who live in households within different income brackets would respond differently to remittances when making labor supply decisions. This objective is crucial because individuals with different levels of education are likely to have different levels of reservation wages (the minimum amount at which they are willing to work) given their skills and bargaining power. Second, individuals in households with high non-remittance income are less likely to be influenced by remittances when they make labor supply decisions. For instance, Cox-Edwards and Rodríguez-Oreggia (2009) argue that if remittances serve only to replace the household income that a migrant would naturally contribute before migration, the labor supply decision of non-migrants will not be affected. Similarly, Asiedu and Chimbar (2020) argue that recipients are likely to reduce labor supply only if remittances exceed a certain reference consumption level. Thus, household members will continue to work given that remittances are below non-remittance income.

Lastly, we also consider the fact that Nigeria is a highly heterogeneous country with regional differences in terms of culture, religion, and development outcomes, such as education and income. Accordingly, we extend our heterogeneity analysis to investigate the effect of remittances on labor supply, conditional on educational attainment and household income, between Northern and the Southern Nigeria. Such an analysis is aimed at stirring discussions into the patterns of migration and remittance behavior between the two regions.

3.3.2 Remittances and Household Entrepreneurship

The productive use of remittances remains an issue of contention. Kharel et al. (2022) argue that remittance recipients in Nepal experience a moral hazard that precludes them from using remittances productively, such as in entrepreneurship development. Thus, Equation (12) investigates the productive use of remittances in Nigeria through their effect on household enterprise revenue:

$$Rev_i^* = \gamma_0 + \gamma_1 Rem_i + \gamma_2 F_i + \gamma_3 (Rem_i * F_i) + \gamma_4 X_i + \mu_i \quad (12)$$

In Equation (12), X now contains firm-level characteristics alongside individual-, household-, and community-level variables that predict enterprise revenue. Rev^* is the latent gross revenue generated per enterprise and is only observed (Rev_i) if $LFP_{Ni}^* > 0$ and *missing* if $LFP_{Ni}^* \leq 0$, where LFP_{Ni}^* is the dummy of owning a non-farm enterprise. Furthermore, we take note of the large informality in our sample (see Figure 3.1) by conditioning the effect of remittances on the formality status of household enterprises. Thus, F is a dummy of 1 if an enterprise is registered with the government (formal) and 0 if not registered (informal), while γ_3 measures the difference in the effect of remittances on entrepreneurship between formal and informal enterprises in Nigeria.

3.3.3 Estimation Techniques and Identification Strategy

The endogeneity of remittances, especially through self-selection bias, is a frequent econometric issue in the remittance-labor supply literature (Asiedu & Chimbar, 2020), which precludes the assessment of the causal effect of remittances on labor supply. Thus, previous studies have explored various techniques to address endogeneity. The most common technique in the literature has been the instrumental variable approach. Other methods include propensity score matching (PSM), the Heckman selection model, and the control function approach (Murakami et al., 2021; Nwokoye et al., 2020).

One of the most common concerns when using the instrumental variable approach is finding a valid instrument that meets the exclusion restriction criteria. That is, finding an instrument that predicts labor supply only through remittances. Nonetheless, we use two instrumental variables (IV) to address the endogeneity of remittances. The first IV is the migration network at the primary sampling unit, which measures the ratio of households that receive remittances to the total number of households in a community. A similar IV is used in Dey (2022) and is assumed to affect remittance receipts because migrants often send remittances through such networks to their families. However, such a network has no direct effect on labor supply decisions, except through remittances. For the second IV, we use the average amount of remittances received per community with improved communication with external environments. A variant of this variable is used in Ainembabazi and Kemeze (2022). The intuition here is that, for communities with improved communication systems, remittances can be easily received through electronic means. However, this does not directly affect the type of job that individuals in the community engage in. The exogeneity of both

IVs is validated using the Amemiya-Lee-Newey (ALN) and Sargan-Hansen Wald tests of over-identifying restrictions with a joint null hypothesis that the instruments are valid.

In line with our identification strategy, we use the instrumental variable Probit (IV-PROBIT) and Tobit (IV-TOBIT) to estimate Equations (10) and (11) for labor force participation (extensive margin; dummy) and labor supply (intensive margins; hours worked), respectively, across occupational categories following Asiedu and Chimbar (2020), Amuedo-Dorantes and Pozo (2006a), and Kharel et al. (2022). The IV-probit and IV-Tobit models are employed to analyze the full sample and the subsamples for heterogeneous effect estimations across educational attainment and household income categories.

As a robustness check for the IV-probit results in the full sample and to obtain point estimates for ease of interpretation, we estimate a linear probability model (LPM) using a two-stage least squares (2SLS) technique. Additionally, to check the robustness of the IV-Tobit technique and correct for the non-random selection of remittance-receiving households, we use the Heckman selection model to re-estimate Equation (11) for labor supply at the intensive margin (outcome equation) using the extensive margin dummy as the selection equation. For the Heckman model, we use the predicted remittance variable from a separate first-stage regression that predicts receiving remittances.

Lastly, in Equation (12), we use only the Heckman selection model to account for self-selection into non-farm enterprises. For instance, since the enterprise revenue outcome variable) is only observed for individuals with non-farm enterprises, and these individuals are not randomly selected into such occupations, it is important to estimate a selection equation that corrects for this potential bias. Hence, our selection Equation in the Heckman model is the probability of owning a non-farm enterprise, while the outcome equation is the enterprise revenue.

3.3.4 Data Description and Source

The data for this section were extracted from Nigeria's Living Standard Measurement Survey (LSMS) of 2018-2019, provided by the National Bureau of Statistics (NBS) with support from the World Bank. The dataset covers an array of socioeconomic characteristics for 22,000 households and approximately 116,000 individuals across the 36 states of Nigeria and the Federal Capital Territory (FCT). With 2,220 enumeration areas (EAs) as its primary

sampling unit (PSU), the survey is nationally representative and entails significant improvements from the to 2009/2010 version of the LSMS (NBS, 2020).

Although the survey contained several modules, we only extracted data from those relevant to our objectives, such as demographic characteristics, labor force, international remittances, non-farm enterprises, and community-level information. Furthermore, we restrict our focus to individuals aged 15 – 65 within the working-age population, thus yielding a sample of 61,169 individuals across 21,193 households. While the demographic and labor market information were used at the individual level, we observe remittances at the household level following the literature (Lucas & Stark, 1985). The full summary statistics for the variables used in this section are reported in Tables A3.5 and A3.6 of the appendix.

Chapter 4: Conditional Effect of Remittances on Entrepreneurship Development

4.1 Introduction

This chapter presents and discusses the empirical findings related to the first objective of the conditional effect of remittances on entrepreneurship development. Section 4.2 examines the moderating role of e-government, while Section 4.3 assesses the viability of financial development in linking remittances to formal entrepreneurship development in developing countries.

4.2 Remittances, E-government, and Entrepreneurship

This subsection evaluates the remittance-entrepreneurship relationship conditional on e-government development for 55 developing countries¹⁴ following the specification in Equation (1) using biennial data from 2007 to 2019. The tables, figures, and discussion in this section were extracted from Alhassan (2022). Columns (1) and (2) of Table 4.1 show the estimated results for ordinary least squares (OLS) and columns (3) and (4) show the results for feasible generalized least squares (FGLS). In the OLS results, the unconditional relationship between remittances and formal entrepreneurship is negative and statistically significant at the 1% level, whereas the conditional relationship (the interaction between remittances and e-government) is insignificant. However, not controlling for the heterogeneity among countries in the OLS estimation makes the results unreliable.

The FGLS results in column (3) show that remittances have a positive but significant association with entrepreneurship. This contradicts the findings of (Ajide & Osinubi, 2020; Zheng & Musteen, 2018) but partly supports the results of Vaaler (2013), Schmutzler et al. (2021), and Yavuz and Bahadir (2021). However, Zheng and Musteen (2018) note that the average remittances per time range are between US\$150 to US\$250 and may be too meager to start opportunity-driven entrepreneurship by the private sector. This may explain the insignificant association between remittances and entrepreneurship in column (3).

Furthermore, the association between e-government development and entrepreneurship is significantly positive, as shown in column (3). This finding highlights the importance of supporting formal entrepreneurship by digitalizing public services and easing business registration procedures, time, and cost. This is also consistent with a broad

¹⁴ See Appendix 4A for the descriptive statistics for the variables used for this section.

range of literature on the relationship between e-government, ICT, business environment, and entrepreneurship (Abu-Shanab & Osmani, 2019; S. Asongu et al., 2019; Das & Das, 2021; Klapper & Love, 2012). Our results imply that countries with better e-government initiatives are better positioned for investment (Al-Sadiq, 2021; Besley, 2015).

In contrast, in a separate study (Haruna & Alhassan, 2022b), we show that beyond affecting formal entrepreneurship development, e-government also reduces the expansion of the informal economy in sub-Saharan African countries. The intuition is that e-government eases the process of formalizing hitherto informal enterprises in Sub-Saharan Africa and facilitates revenue generation for governments (see Table A4.2 for the results). Our findings are consistent with those of previous studies, including that of Elbahnasawy (2021).

Table 4.1: Remittances, E-government, and Entrepreneurship - OLS and FGLS Results

	(1) OLS	(2) OLS	(3) FGLS	(4) FGLS
Remittances	-.205*** (.062)	-.124 (.171)	.007 (.023)	-.12*** (.032)
E-government	-.415 (1.20)	.288 (1.827)	.567** (.248)	-.849** (.368)
Rem * Egov		-.192 (.394)		.333*** (.069)
GDP growth rate	.022 (.028)	.022 (.033)	.002 (.003)	.002 (.003)
GDP per capita	-.007 (.176)	.01 (.142)	.233** (.112)	.231** (.104)
Economic Glob. Index	.063*** (.010)	.064*** (.012)	.01*** (.003)	.008*** (.003)
Government spending	.014 (.010)	.014 (.011)	-.033*** (.005)	-.032*** (.005)
Financial Development	3.710*** (.919)	3.669*** (1.301)	2.012*** (.276)	1.723*** (.254)
Property Right	.257** (.109)	.259** (.128)	.013 (.019)	.011 (.017)
Unemployment rate	.058*** (.018)	.057*** (.021)	.005 (.008)	.009 (.008)
Constant	-4.28*** (1.227)	-4.608*** (1.286)	-2.352** (.925)	-1.731** (.88)
Observations	300	300	300	300
Wald Stat (Chi2)	-	-	6533.67	7921.704
No. of Countries	52	52	52	52
Country FE	NO	NO	YES	YES
Year FE	YES	YES	YES	YES

*Robust standard errors are in parentheses; ** $p < .01$, *** $p < .05$, * $p < .1$. GDP per capita and Remittances per capita are in natural log. Dependent variable = New business density*

$$\frac{\partial(nbd_{it})}{\partial(rem_{it})} = -0.12 + 0.333egov_{it} \quad (12)$$

Column (4) presents the interactive effects of e-government and remittances on entrepreneurship. The interaction coefficient shows a positive and significant association with entrepreneurship in the overall sample, confirming part of this study's first objective. The results show that the coefficient of remittances is -0.12, while that of the interaction with e-government is 0.33. Hence using Equation (12), for an economy with a mean e-government index of 0.43, the net impact of remittances on entrepreneurship is 0.02 per 1000 adult population, holding other factors constant. Although the coefficient is positive, substantial amounts of remittances may be needed for a meaningful increase in formal enterprise establishments.

The implication of the above finding under the Coasian Transaction Cost Economics framework is that effective diaspora engagement initiatives by governments are crucial for reducing the costs of searching, discovering, investing, and monitoring formal enterprises by migrants in their home countries. Furthermore, under the Williamson framework, this e-government effect provides an avenue for less opportunism for migrants. Hence, without such government commitment through service provision to migrants, remittances are likely to be channeled towards household usage, which may reduce their effect on entrepreneurship (Acosta et al., 2009).

Lastly, regarding the control variables, GDP per capita, economic globalization, and financial development positively influence formal entrepreneurship, while government expenditure negatively affects entrepreneurship. These findings align with those of previous studies (Dutta & Sobel, 2018; Urbano et al., 2020; Yavuz & Bahadir, 2021) and indicate that higher per capita income, financial development, and integration into the global economy increase the establishment of formal firms. On the other hand, the coefficient of government spending is in line with the argument that higher government spending signifies government involvement in economic activities, leading to the crowding out of private investments (Aidis et al., 2012; Islam, 2015). Lastly, the protection of property rights shows a positive and insignificant association with entrepreneurship in the FGLS estimation. The positive association partly supports the argument developed in section 2.4.1 on the importance of institutions in supporting entrepreneurship development and growth.

4.2.1 Estimations with the Components of E-government

Next, we provide evidence from the disaggregated components of e-government by replacing the overall e-government development index with its components (OSI, HCI, and TII) in different specifications, and present the results in Table 4.2. The findings show that only the telecommunication infrastructure index (TII) directly affects entrepreneurship at the 1% significance level, while the others are positive but insignificant. For instance, in column (3), a 0.01-point increase in TII increases entrepreneurship by 0.51 units per 1000 adult population. This finding confirms the submission of Elbahnasawy (2021), who argues that TII is more important than other components of e-government in reducing the proliferation of the shadow economy.

Furthermore, interacting OSI, HCI, and TII with remittances show significantly positive effects on entrepreneurship for OSI and TII and a positive but insignificant effect for HDI. The magnitude is larger for TII (0.252) in column (7) and more than twice that of OSI (0.118) in column (5). This result indicates that the availability of telecommunication infrastructure plays a crucial role in facilitating remittance transfers (Asongu et al., 2019) and in the remote management of migrants' owned enterprises (Andreotti & Solano, 2019). Nonetheless, the significance of both the OSI and TII lends credence to our initial argument on the importance of diaspora engagement through digital service provision to reduce the cost of opportunity identification for migrants by their home countries' governments while also facilitating remittance transfers and reducing opportunism. Lastly, column (8) of Table 4.2 shows the importance of e-participation (EPART), a supplementary index of e-government that measures the inclusiveness of e-government in fostering the remittance-entrepreneurship nexus in developing countries. The results show a positive association between remittances and entrepreneurship conditional on e-participation. Hence, as people feel more confident about the government through their active participation, they are likely to use their remittances for entrepreneurship.

Table 4.3 presents the marginal effect of remittances on entrepreneurship, conditional on different values of e-government and its components, following Equation (2) from Chapter 3. Notably, as the values of e-government increase, the net effect of remittances on entrepreneurship becomes significantly positive and larger in magnitude. Furthermore, we provide marginal effects plots in Figure 4.1, to explicitly show the effects of remittances on entrepreneurship for different values of e-government and its components.

As shown in Figure 4.1, remittances and entrepreneurship have a positive relationship as we move up on the values of e-government and its components. Interestingly, the negative effect of remittances becomes positive faster for small increases in TII compared to OSI and HCI. This indicates the urgency of investing in telecommunication infrastructure as an initial step towards effective diaspora engagement and facilitating remittance transfer.

Table 4.2: Remittances, E-government Components, and Entrepreneurship – Full Sample

	No Interaction Term				With Interaction Term			
	(1) NBD	(2) NBD	(3) NBD	(4) NBD	(5) NBD	(6) NBD	(7) NBD	(8) NBD
Remittance	.002 (.023)	.002 (.023)	-.005 (.022)	-.003 (.022)	-.026 (.02)	-.06 (.067)	-.05** (.025)	-.007 (.023)
OSI	.111 (.102)				-.364** (.177)			
Rem * OSI					.118*** (.037)			
HCI		.125 (.229)				-.21 (.386)		
Rem * HCI						.092 (.088)		
TII			.511*** (.166)				-.635** (.27)	
Rem * TII							.252*** (.05)	
EPART				-.019 (.078)				-.374** (.155)
Rem*Epart								.087*** (.031)
GDP grth	.003 (.003)	.002 (.003)	.002 (.003)	.002 (.003)	.002 (.003)	.003 (.003)	.001 (.003)	.002 (.003)
GDP PC	.257** (.114)	.298*** (.104)	.259** (.103)	.344*** (.101)	.301*** (.106)	.281*** (.106)	.182* (.104)	.324*** (.107)
Econ_Glob	.01*** (.003)	.01*** (.003)	.01*** (.003)	.01*** (.003)	.009*** (.003)	.01*** (.003)	.009*** (.003)	.008** (.003)
Govt spend	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)	-.03*** (.005)
Fin. Dev.	2.04*** (.282)	2.01*** (.297)	1.79*** (.301)	2.07*** (.298)	1.86*** (.263)	1.96*** (.299)	1.61*** (.316)	1.81*** (.289)
Prop. Right	.011 (.019)	.008 (.02)	-.001 (.019)	.004 (.02)	.012 (.018)	.009 (.02)	-.01 (.017)	.008 (.017)
Unemp.	.004 (.009)	.002 (.009)	.004 (.008)	.000 (.009)	.005 (.009)	.002 (.009)	.008 (.008)	.006 (.009)
Constant	-2.4** (.949)	-2.8*** (.907)	-2.29*** (.868)	-2.97*** (.86)	-2.59*** (.896)	-2.404** (.946)	-1.43 (.879)	-2.74*** (.903)
Obs.	300	300	300	300	300	300	300	300
Wald (Chi2)	6311.1	6316.67	6853.939	6336.948	7368.582	6366.682	8410.227	6932.059
Countries	52	52	52	52	52	52	52	52
Country_FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; ** $p < .01$, * $p < .05$, * $p < .1$.

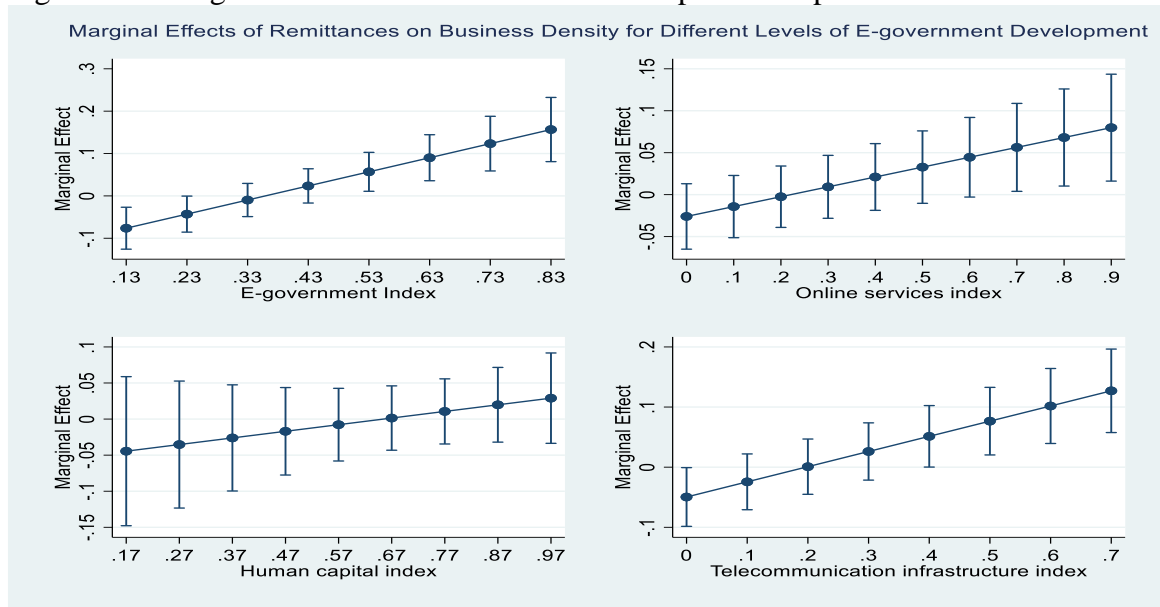
EGOV=Egovernment Index (Overall); OSI=Online Services Index; HCI=Human Capital Index; TII=Telecommunication Infrastructure Index; EPART=E-participation Index. GDP per capita and Remittances per capita are in natural logs. Dependent variable: New Business Density

Table 4.3: Marginal Effect of Remittances on Entrepreneurship by E-government

	EGOV		OSI		HCI		TII	
	Values	Impacts	Values	Impacts	Values	Impacts	Values	Impacts
At zero	0	-0.12***	0	-0.023	0	-0.047	0	-0.039
Minimum	0.13	-0.07***	0.00	-0.023	0.17	-0.032	0.00	-0.039
25 th P	0.31	-0.009	0.22	0.005	0.53	-0.002	0.11	-0.011
Median	0.41	0.027	0.35	0.021	0.68	0.008	0.20	0.012
Mean	0.42	0.03	0.39	0.026	0.64	0.011	0.24	0.022
75 th P	0.52	0.066***	0.55	0.046**	0.77	0.019	0.33	0.045*
Maximum	0.84	0.181***	0.95	0.096***	0.98	0.037	0.76	0.154***

Source: Author's calculations. *** $p < .01$, ** $p < .05$, * $p < .1$.

Figure 4.1: Marginal Effect of Remittances on Entrepreneurship Plots



4.2.2 Additional Finding: Estimations at the Regional and Income Groups Levels

As a sequel to the initial findings in the overall sample, this subsection explores the possible variations in the remittance-e-government-entrepreneurship nexus across regional and income classifications, as shown in Table 4.4. Across regions, the conditional effect of remittances on entrepreneurship is positive for Africa, Asia, and LAC but only significant for Africa at the 5% significance level. This finding supports the previous results on the importance of government in reducing transaction costs for migrants and promoting remittance-based entrepreneurship in developing countries. It also provides empirical support for examples of e-government implementation in some African countries in engaging their diaspora for development, as discussed in Section 2.4.1.

In terms of income classification, the interaction terms between remittances and e-government for both emerging market economies and low-income countries are positive but

only statistically significant for the emerging market economies at 10%. However, these findings are insufficient to confirm the differences in the effectiveness of diaspora engagement across regions and income groups.

Table 4.4: Additional Findings - Regression Results for Regional and Income Groups

	Regional Level			Income Groups	
	(1) Africa	(2) Asia	(3) LAC	(4) EM	(5) LIC
Remittances	-.146*** (.055)	.039 (.08)	-.427 (.738)	-.108 (.109)	-.2 (.182)
E-government	-1.529** (.712)	.188 (1.084)	-.114 (4.425)	-1.493 (1.04)	-2.717 (2.767)
Rem * Egov	.336** (.157)	.156 (.218)	.157 (.755)	.387* (.216)	.443 (.608)
GDP growth rate	.000 (.004)	.018** (.009)	.016 (.025)	.021** (.009)	.016* (.009)
GDP per capita	.847*** (.143)	-.552* (.286)	1.347*** (.504)	.004 (.244)	-.062 (.597)
Economic Globalization	-.002 (.004)	.015** (.008)	.035** (.015)	.012 (.009)	.007 (.014)
Government spending	-.001 (.006)	-.065*** (.004)	-.2*** (.053)	-.005 (.015)	-.053*** (.006)
Financial Development	.556 (.704)	1.48*** (.487)	5.992*** (1.345)	2.305*** (.608)	1.743 (1.552)
Property Right	.015 (.021)	.084* (.044)	.059 (.101)	.018 (.037)	.000 (.165)
Unemployment rate	-.001 (.011)	.015 (.021)	.044 (.031)	.015 (.019)	.113** (.053)
Constant	-6.43*** (1.149)	3.419 (2.274)	-12.29*** (4.388)	-.6 (2.317)	1.004 (3.749)
Observations	129	102	69	184	119
Wald Stat (Chi2)	2734.971	5712.76	1381.923	2718.334	1616.501
No. of Countries	23	17	12	30	22
Country FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; ** $p < .01$, * $p < .05$, $p < .1$.*

Dependent variable for columns 1-5: New Business Density. EM=Emerging Market Economics, LIC=Low Income Countries. GDP per capita and Remittances per capita are in natural log

4.2.3 Robustness Check: Driscoll-Kraay and Instrumental Variable Regressions

To account for the possible underestimation of standard errors by the FGLS technique (Beck & Katz, 1995) and to provide a robustness check, the FGLS results were re-evaluated using the Driscoll-Kraay standard error technique for fixed and random effects. This method is robust to cross-sectional dependence and autocorrelation (Hoechle, 2007). The results are

presented in Table 4.5 for the fixed and random effects, and they confirm the earlier findings from the FGLS results in Tables 4.1 and 4.2. Hence, for the overall e-government index, online services index, and telecommunications infrastructure index, the conditional effects of remittances on entrepreneurship are positive and significant.

Table 4.5: Robustness Check - Regression with Driscoll-Kraay Standard Errors

	Fixed Effect				Random Effect			
	(1) NBD	(2) NBD	(3) NBD	(4) NBD	(5) NBD	(6) NBD	(7) NBD	(8) NBD
Remittances	-.196** (.062)	-.052 (.053)	.027 (.129)	-.099* (.049)	-.245*** (.045)	-.076 (.058)	-.071 (.184)	-.13*** (.034)
Egov	-1.095 (.732)				-1.477* (.701)			
Rem * Egov	.434*** (.107)				.484** (.182)			
OSI		-.425* (.175)				-.361 (.338)		
Rem * OSI		.15*** (.037)				.138* (.06)		
HCI			-.087 (.705)				-.492 (.992)	
Rem * HCI			-.034 (.194)				.061 (.329)	
TII				-.53 (.651)				-1.06** (.303)
Rem * TII				.359** (.121)				.396*** (.105)
GDP growth	.004 (.004)	.004 (.004)	.004 (.004)	.005 (.004)	.003 (.004)	.003 (.004)	.003 (.004)	.003 (.004)
GDP PC	.532** (.162)	.554*** (.132)	.585*** (.121)	.521** (.148)	.301*** (.051)	.308*** (.069)	.354*** (.062)	.288*** (.048)
Econ. Global	.012* (.005)	.012* (.005)	.012* (.005)	.012** (.004)	.028** (.01)	.029** (.011)	.029** (.011)	.03** (.009)
Govt spend	-.05*** (.003)	-.05*** (.004)	-.05*** (.004)	-.05*** (.003)	-.02** (.007)	-.022** (.008)	-.023** (.007)	-.02** (.007)
Fin. Dev.	1.9*** (.258)	2.1*** (.28)	2.2*** (.286)	1.6*** (.315)	2.842** (1.15)	2.936** (1.119)	3** (1.043)	2.726* (1.259)
Prop. Right	-.008 (.03)	-.002 (.031)	-.006 (.035)	-.025 (.03)	.021 (.063)	.028 (.063)	.022 (.062)	.008 (.064)
Unemp.	.021 (.014)	.018 (.014)	.019 (.015)	.028 (.017)	.055*** (.013)	.052*** (.012)	.052*** (.011)	.06*** (.013)
Constant	-2.94** (.797)	-3.5*** (.76)	-3.82** (1.187)	-2.9** (.845)	-2.67*** (.649)	-3.291*** (.785)	-3.44*** (.581)	-2.8*** (.543)
Observations	300	300	300	300	300	300	300	300
Wald (Chi2)	-	-	-	-	13168.519	19208.371	2632.398	965.575
No. Countries	52	52	52	52	52	52	52	52
R-Squared	.191	.184	.18	.199	.33	.328	.331	.334
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; ** $p < .01$, * $p < .05$, * $p < .1$.

Dependent variable for columns 1-8: New Business Density. EGOV=Egovernment Index (Overall); OSI=Online Services Index; HCI=Human Capital Index; TII=Telecommunication Infrastructure Index; EPART=E-participation Index. GDP per capita and Remittances per capita are in natural log

Table 4.6: Robustness Check - Instrumental Variable Regression (D-K)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dep. Rem	NBD	NBD	NBD	NBD	NBD	NBD
Instrument	.537*** (.103)						
Remittances		.002 (.095)	-.349* (.155)	-.104 (.102)	-.129 (.287)	-.195 (.106)	-.066 (.09)
E-government	-.089 (.467)	.948*** (.189)	-1.981* (.79)				
Rem * Egov			.694** (.225)				
OSI				-.858* (.344)			
Rem * OSI				.244** (.093)			
HCI					-.644 (1.136)		
Rem * HCI					.17 (.318)		
TII						-1.669 (.875)	
Rem * TII						.599** (.151)	
EPART							-.812** (.239)
Rem * EPART							.222** (.06)
GDP growth rate	.012*** (.003)	.009** (.003)	.01*** (.001)	.009*** (.002)	.012*** (.002)	.009*** (.002)	.009*** (.002)
GDP per capita	1.002*** (.196)	.427* (.171)	.758** (.194)	.602** (.167)	.488** (.174)	.88*** (.183)	.624*** (.154)
Econ. Globalization	.015* (.006)	.015 (.013)	.012 (.01)	.012 (.011)	.013 (.012)	.016 (.01)	.012 (.011)
Govt spending	.042*** (.006)	-.046*** (.004)	-.038*** (.003)	-.044*** (.003)	-.045*** (.004)	-.04*** (.003)	-.043*** (.003)
Fin. Development	-2.228* (.908)	2.053*** (.287)	1.649*** (.209)	1.91*** (.234)	2.068*** (.359)	1.501*** (.371)	1.755*** (.178)
Property Right	-.127*** (.014)	-.004 (.041)	-.028 (.041)	-.011 (.038)	-.017 (.051)	-.05 (.044)	-.013 (.04)
Unemployment rate	.036** (.012)	.011 (.026)	.025 (.033)	.018 (.029)	.015 (.028)	.038 (.033)	.021 (.03)
Observations	250	250	250	250	250	250	250
No. of Countries	52	52	52	52	52	52	52
R-Squared	.468	.204	.233	.211	.2	.252	.215
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; ** $p < .01$, * $p < .05$, $p < .1$.

Dependent variable for columns 2-7: New Business Density. EGOV=E-government Index (Overall); OSI=Online Services Index; HCI=Human Capital Index; TII=Telecommunication Infrastructure Index; EPART=E-participation Index. GDP per capita and Remittances per capita are in natural log

Next, the study uses the instrumental variable approach to address the possible endogeneity of remittances and presents the results in Table 4.6. The first-stage regression is estimated using the first lag of remittances as an instrument, as column (1) shows.

Columns (2) – (7) show the second-stage regressions. Notably, the results support those in Tables 4.1 and 4.2, suggesting that e-government and its components effectively drive remittances for formal entrepreneurship development in developing countries.

To conclude, this section has shown compelling evidence in light of transaction cost economics theory that remittance-based formal entrepreneurship development in migrant-sending countries can be achieved through e-government development. In other words, the use of digital infrastructure by the governments of migrant-sending countries to reduce the transaction costs associated with searching and investing in viable business ventures by migrants could unlock developing countries' potential to finance entrepreneurship development using migrants' transfers. The following section explores the role of the domestic financial sector, especially banks, in facilitating the development of remittance-based formal entrepreneurship in developing countries.

4.3 Remittances, Financial Development, and Formal Entrepreneurship

This section presents the findings of the study considering financial development as a moderator for the remittance-entrepreneurship relationship for a sample of 79 developing countries¹⁵ as part of the first objective using data from 2006 to 2020¹⁶. Beginning with the empirical results from the fixed effects estimation in Table 4.7, columns (1) and (2) show the results for the IMF financial institution index as the main measure of financial development, while columns (3) - (10) show those of the alternative measures of financial development with and without interaction terms¹⁷. As shown in columns (1), (3), (5), (7), and (9), the unconditional coefficients of remittances have significantly negative relationships with formal entrepreneurship. Although this contradicts our expectation, it confirms the results of Zheng and Musteen (2018) and Ajide and Osinubi (2020) and other studies (Ademe Ayalew & Mohanty, 2022; Kharel et al., 2022) that infer a negative effect of remittances on entrepreneurship through a reduction in labor supply or hours worked. Thus, the negative relationship can be explained by the effect of remittances on labor force participation and occupational choice.

¹⁵ See Appendix 4B for the descriptive statistics for the variables used in this section.

¹⁶ The results and discussions in this section are taken from my unpublished manuscript (Alhassan et al., 2023a).

¹⁷ The alternative measures of financial development include domestic credit to the private sector, liquid liability, deposit money banks assets, and lending rate.

Several studies (Airola, 2008; Chami et al., 2018) have shown that, despite increasing household welfare and smoothing consumption, remittances tend to increase non-labor income, thereby reducing the incentive to work or start an enterprise. For instance, Amuedo-Dorantes and Pozo (2006b) find a negative relationship between remittances and enterprise ownership, whereas Kharel et al. (2022) find a negative relationship between remittances and hours worked, leading to reduced non-farm enterprise revenue. Furthermore, since formal entrepreneurship requires more financial and human capital and involves many risks (Zheng & Musteen, 2018) and several establishment processes, remittance recipients may have less incentive to engage in such ventures without assistance.

Next, the effect of financial development measures on entrepreneurship is negative and significant for interest rates, but positive and insignificant for financial institutions. Specifically, a one percent increase in lending rate lowers new business density by 0.03 units per 1,000 working-age population. Other measures, including domestic credit, liquid liability, and bank assets, have negative, but insignificant, direct relationships with formal entrepreneurship. This finding suggests that the lending rate weighs higher in determining the accessibility of credit by early-stage entrepreneurs in developing countries. Hence, a financial development strategy that reduces the lending rate for budding entrepreneurs is likely to be more effective in developing countries.

On the control variables, the results in Table 4.7 suggest that GDP per capita, trade openness, and institutional quality are strong predictors of formal entrepreneurship development in developing countries. Furthermore, the unemployment rate positively correlates with formal entrepreneurship in developing countries. This finding is interesting as it contradicts the notion that unemployment and poverty are often the main catalysts for engaging in informal entrepreneurship (Acs, 2006; Schmutzler et al., 2021). Hence, this finding shows that even the unemployed are not devoid of the characteristics of an opportunity entrepreneur and may engage in formal entrepreneurship, given effective support systems. Such support systems can stem from skill empowerment programs for the unemployed and preferential business registration regulations.

In columns (2), (4), (6), (8), and (10) of Table 4.7, the interactions between remittances and financial development show positive relationships with entrepreneurship for all measures of financial development, except the lending rate. Moreover, the coefficients range from 0.04 to 0.07 and are statistically significant at the 1% significance

level. This implies that local financial institutions are essential for channeling remittances into entrepreneurship in developing countries. This finding agrees with the findings of Kratou and Gazdar (2016) and Nyamongo et al. (2012) on the complementarity between remittances and financial development in positively affecting economic growth.

Moreover, this relationship is also intuitive since financial development entails financial inclusion. When remittance recipients approach financial institutions to claim transfers, they are likely to be introduced to financial services that support entrepreneurship, thereby shaping their interest in investing in entrepreneurship (Nyamongo et al., 2012). In addition, receiving remittances may improve recipients' creditworthiness, as they signal the ability of the receiver to repay loans. Barajas et al. (2009) opine that in this way, remittances form part of the household's collateral by providing access to loans for investment and capital accumulation. Osili (2004) further provides evidence of such a signaling effect in Nigeria, where remittances pave the way for left-behind household members to access both formal and informal credit and insurance markets. Lastly, when migrants transfer their savings to their home countries' financial institutions due to higher interest rates or in response to certain financial services, such savings can be extended to investors or opportunity entrepreneurs for investment.

Next, the marginal percentile effect plots of remittances on entrepreneurship conditional on all financial development measures, except the lending rate, are presented in Table 4.8 and Figure 4.2. As shown in Table 4.8, remittances have negative associations with entrepreneurship at low levels of financial development indicators but become positive at high levels. Similarly, as Figure 4.2, the negative coefficients of remittances decline in magnitude as financial institutions continue to develop. This improving trend continues until the relationship becomes positive in countries where the IMF financial institutions development index (IMF_FII) is at 57%. A similar trend occurs for the alternative measures of financial development, such as when domestic credit to the private sector is 54% of GDP, liquid liability is 71% of GDP, and money bank assets are deposited at 61% of GDP. This positive relationship further increases in significance at the 95th percentile of the proxies for financial development. Essentially, this evidence indicates that remittances have a positive relationship with formal entrepreneurship in countries with improved financial development.

Table 4.7: Remittances, Financial Development, and Entrepreneurship – Baseline Results

	IMF_FII		Alternative Measures of Financial Development							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	NBD	NBD	NBD	NBD	NBD	NBD	NBD	NBD	NBD	NBD
Remittances	-.195 (.196)	-3.4*** (.902)	-.551* (.276)	-2.243*** (.585)	.229 (.689)	.642 (1.249)	-.564* (.287)	-3.49*** (.806)	-.594* (.291)	-4.283*** (.995)
GDP growth	.006 (.012)	.005 (.011)	.006 (.011)	.007 (.011)	.013 (.016)	.012 (.016)	.007 (.011)	.006 (.011)	.007 (.011)	.007 (.011)
GDP per capita	1.278** (.445)	1.43*** (.396)	1.46*** (.319)	1.575*** (.303)	.998 (.744)	1.053 (.67)	1.46*** (.437)	1.58*** (.428)	1.39*** (.371)	1.601*** (.381)
Trade openness	.013*** (.004)	.012*** (.004)	.014*** (.004)	.013*** (.004)	.016*** (.005)	.016*** (.005)	.016*** (.004)	.015*** (.004)	.015*** (.004)	.014*** (.004)
Unemployment	.071** (.033)	.072** (.031)	.058* (.031)	.058* (.03)	.072* (.036)	.074* (.037)	.058 (.037)	.061 (.035)	.057 (.034)	.062* (.03)
Inst. Quality	.012** (.005)	.01* (.005)	.009 (.005)	.01** (.004)	.014* (.007)	.013** (.006)	.011** (.004)	.014*** (.003)	.011** (.004)	.014*** (.003)
Govt. expend.	.015 (.016)	.017 (.016)	.011 (.015)	.014 (.015)	.016 (.02)	.017 (.02)	.009 (.016)	.015 (.016)	.009 (.016)	.015 (.016)
Days to start biz	-.014 (.009)	-.015 (.009)	-.014 (.009)	-.014 (.009)	-.012 (.01)	-.012 (.009)	-.014 (.009)	-.014 (.009)	-.014 (.009)	-.014 (.009)
Pop. Growth	-.003 (.075)	-.028 (.075)	-.024 (.059)	-.076 (.06)	-.074 (.106)	-.078 (.101)	-.028 (.057)	-.091** (.037)	-.034 (.058)	-.13** (.056)
IMF_FII	.006 (.011)	-.006 (.01)								
Rem* IMF_FII		.06*** (.014)								
DCP			-.001 (.006)	-.009 (.007)						
Rem*DCP				.042** (.017)						
Int_lend					-.032*** (.008)	-.028** (.013)				
Rem*Int_lend						-.042 (.068)				
LL_GDP							-.004 (.003)	-.014*** (.003)		
Rem*LL_GDP								.05*** (.015)		
Bank_asset									-.001 (.004)	-.015** (.006)
Rem*Bank_asset										.07*** (.021)
Constant	-10.3*** (2.938)	-10.9*** (2.659)	-11.3*** (2.16)	-11.94*** (2.148)	-7.92 (5.019)	-8.347* (4.472)	-11.3*** (3.089)	-11.86*** (3.188)	-10.9*** (2.561)	-11.99*** (2.802)
Observations	836	836	870	870	704	704	856	856	856	856
No. of countries	76	76	79	79	67	67	78	78	78	78
R-squared	.134	.136	.137	.141	.159	.159	.141	.149	.141	.157
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$

Note: Dependent Variable=New Business Density, DCP=Domestic credit to the private sector/GDP, LL_GDP=Liquid Liability/GDP, Int_lend=Lending Rate, Bank_asset=Deposit Money Bank Asset/GDP, IMF_FII =Financial Institutions Development from IMF, Rem=Remittances per capita.

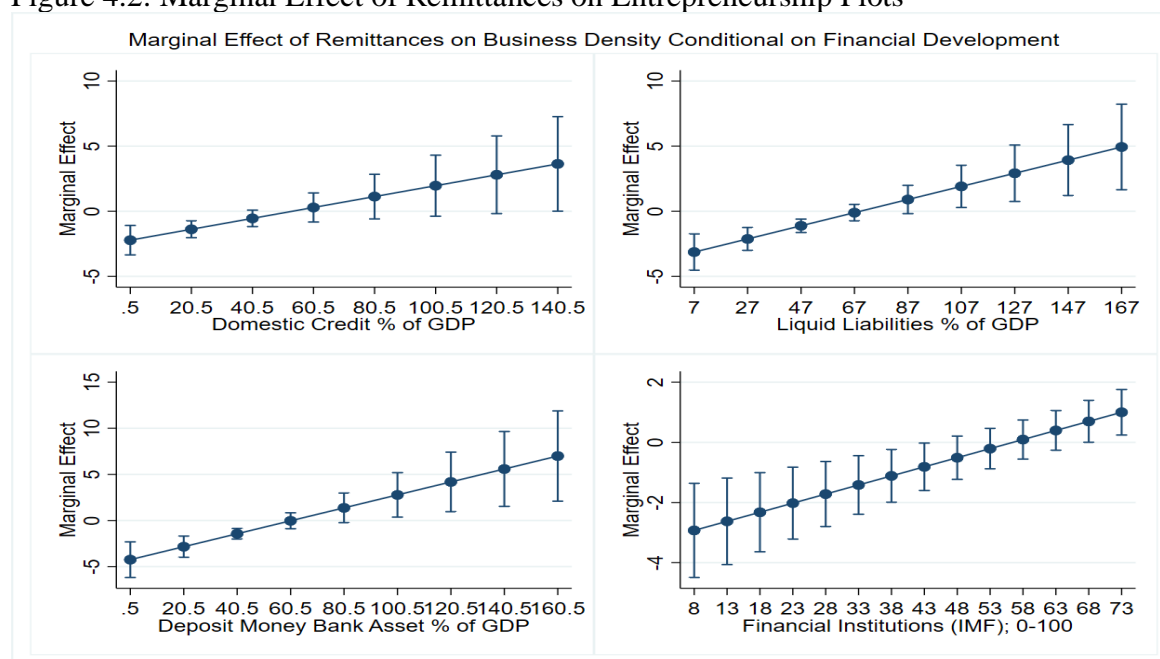
Table 4.8: Marginal Effect of Remittances on Entrepreneurship by Fin. Dev.

	IMF_FII		DCP		LL_GDP		Bank_Asset	
	Values	Impacts	Values	Impacts	Values	Impacts	Values	Impacts
10 th	17.7	-2.34***	11.1	-1.78***	20.3	-2.47***	15.2	-3.22***
25 th	23.2	-2.01***	17.8	-1.5***	26.8	-2.14***	23.2	-2.65***
Median	33.9	-1.36***	31.5	-0.93***	41.5	-1.4***	43.2	-1.24***
Mean	34.6	-1.32***	37.8	-0.66**	49.4	-1***	48.6	-0.87***
75 th	42.8	-0.83**	51.9	-0.07	65.2	-0.1	65	0.28
95 th	65.9	0.57*	89.3	1.49	109	2.01**	110.4	3.47**

Source: Authors' Calculation from DK Estimation Results

Note: DCP=Domestic Credit to the private sector/GDP, LL_GDP=Liquid Liability/GDP, Bank_Asset = Deposit Money Bank Asset/GDP, IMF_FII =Financial Institutions Development from IMF; *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 4.2: Marginal Effect of Remittances on Entrepreneurship Plots



Source: Authors' calculations from the Driscoll-Kraay estimation results

4.3.1 Robustness Check 1: Two-Step System GMM

As noted in Chapter 3, remittances and other macroeconomic variables are likely to be endogenous, whereas entrepreneurship may be persistent and influenced by its past values. To address these concerns, this section uses the two-step system GMM estimation technique (Arellano & Bover, 1995; Blundell & Bond, 1998), and presents the results in Table 4.9. In the GMM estimates, most explanatory variables appear insignificant. However, contrary to our expectations, the coefficient of government expenditure shows a significant positive relationship with entrepreneurship in some specifications. This result indicates that

government participation may promote entrepreneurship (Islam 2015). This can be achieved by providing subsidies and startup funds to encourage entrepreneurs.

Table 4.9: Remittances, Financial Development, and Entrepreneurship - Sys-GMM

	IMF_FII		Alternative Measures of Financial Development							
	(1) NBD	(2) NBD	(3) NBD	(4) NBD	(5) NBD	(6) NBD	(7) NBD	(8) NBD	(9) NBD	(10) NBD
Lag NBD	.88*** (.125)	.85*** (.127)	1.00 (.11)	.89*** (.105)	.94*** (.078)	.94*** (.072)	.89*** (.09)	.89*** (.079)	.91*** (.117)	.882*** (.094)
Remittances	-.663 (.553)	-4.8** (2.354)	.161 (.394)	-2.35* (1.206)	.039 (.686)	1.576* (.841)	-.068 (.518)	-2.372* (1.226)	-.112 (.488)	-3.193* (1.611)
GDP growth	.032 (.025)	.032 (.024)	.044** (.02)	.049* (.027)	.006 (.041)	.005 (.055)	.017 (.03)	.027 (.028)	.041 (.028)	.051* (.031)
GDP per capita	.27 (.58)	.338 (.609)	.106 (.35)	.231 (.318)	-.421** (.201)	-.529 (.38)	-.855 (.515)	-.636 (.48)	-.336 (.608)	.121 (.263)
Trade openness	.004 (.005)	-.001 (.005)	.002 (.004)	.003 (.005)	.007 (.008)	.003 (.008)	.003 (.008)	.001 (.006)	-.001 (.008)	-.003 (.007)
Unemployment	-.003 (.022)	-.006 (.033)	-.004 (.029)	-.007 (.021)	.057** (.028)	.07 (.055)	.063 (.046)	.048 (.038)	.033 (.054)	.023 (.042)
Inst. Quality	.021 (.013)	.032* (.016)	-.003 (.01)	.003 (.01)	.008 (.009)	.009 (.017)	.021 (.015)	.018 (.014)	.01 (.01)	.008 (.01)
Govt. expend.	.016** (.007)	.018** (.009)	.016* (.008)	.019** (.009)	-.015 (.016)	-.017 (.016)	-.004 (.011)	-.003 (.012)	.017* (.01)	.014 (.011)
Days to start biz	-.005 (.005)	-.006 (.006)	-.004 (.004)	-.004 (.004)	.000 (.001)	.001 (.001)	.001 (.001)	.001 (.001)	.000 (.002)	-.001 (.001)
Pop. Growth	-.005 (.072)	-.064 (.11)	-.014 (.056)	-.062 (.08)	-.095 (.1)	-.144 (.141)	-.179 (.113)	-.243** (.096)	-.123 (.081)	-.181* (.101)
IMF_FII	-.015 (.023)	-.027 (.03)								
Rem* IMF_FII		.096* (.052)								
DCP			.001 (.004)	-.005 (.006)						
Rem*DCP				.051** (.024)						
Int_lend					.017 (.037)	.022 (.028)				
Rem*Int_lend						-.145* (.085)				
LL_GDP							.000 (.008)	-.005 (.007)		
Rem*LL_GDP								.042** (.02)		
Bank_asset									.001 (.005)	-.008 (.006)
Rem*Bank_asset										.054* (.029)
Constant	-2.513 (3.825)	-2.544 (3.937)	-1.028 (2.74)	-1.855 (2.755)	2.162 (1.808)	3.349 (3.482)	5.846 (3.812)	4.736 (3.43)	2.054 (4.453)	-.602 (2.131)
Observations	769	769	800	800	650	650	787	787	787	787
No. of countries	76	76	79	79	67	67	78	78	78	78
Instruments	69	74	64	71	61	66	62	68	64	69
AR(1)	.029	.031	.019	.019	.019	.02	.024	.021	.023	.02
AR(2)	.242	.226	.115	.107	.219	.209	.139	.111	.127	.09
Hansen	.391	.392	.86	.563	.877	.668	.247	.327	.355	.406
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$

With respect to the interaction between remittances and financial development, we find support for the initial findings from the Driscoll-Kraay (DK) fixed-effects estimations – remittances and financial development play a complementary role in influencing formal

entrepreneurship in developing countries. These coefficients are comparable to those of the DK estimations in Table 4.7. Furthermore, the lag of new business density is positive and significant for virtually all measures of financial development. Thus, previous successes influence contemporaneous entrepreneurship activities.

4.3.2 Robustness Check 2: Sensitivity Test with Alternative Controls

Table 4.10 presents the findings with the alternative control variables. For brevity, only the results for models with interaction terms are reported. Here, new control variables such as corruption control, education as a measure of human capital, domestic investment, the protection of property rights, inflation rate, and the freedom to trade internationally are introduced to evaluate the sensitivity of the earlier findings. As shown in Table 4.10, control of corruption, domestic investment, and freedom to trade internationally are positively associated with formal entrepreneurship. This indicates that aside from investment, institutional factors are crucial to support formal entrepreneurship development in developing countries, as strong institutions improve investors' (migrants') confidence.

In columns (1), (2), and (5), where remittances interact with the IMF's financial institution development, domestic credit to the private sector, and deposit money bank assets, we find positive associations with formal entrepreneurship. However, in column (3), we find that remittances are negatively associated with formal entrepreneurship as the lending rates increase. These findings support the results in the preceding tables and indicate the relevance of financial development in promoting remittance-based formal entrepreneurship in developing countries.

4.3.3 Robustness Check 3: Estimations with Alternative Dependent Variable

We re-evaluated our findings using a different measure of the dependent variable. In the preceding estimations, we use new business density as a measure of a new formal business in a country. In this section, we assess the remittance-financial development interaction on total business density for all five measures of financial development and present the results in Table 11. The new dependent variable measures the density of the annual total of formal enterprises per 1000 working-age population per country. The variable is different from the new business density used in previous estimations, as it captures the overall private enterprises with limited liability status in a country, regardless of the year of establishment. The findings provide support for Tables 4.7 and 4.9 and suggest that remittances influence

total formal enterprises in countries with better financial institutions. Intuitively, these results suggest the possibility of using remittances to expand existing formal enterprises, which goes beyond funding new establishments, as reported in previous tables.

Table 4.10: Sensitivity Test with Alternative Controls

	(1) NBD	(2) NBD	(3) NBD	(4) NBD	(5) NBD
Remittances	-7.82*** (1.545)	-.105 (1.112)	4.547** (1.697)	1.708 (1.522)	-.582 (1.233)
GDP growth rate	.014 (.012)	.02* (.011)	.014 (.014)	.017 (.011)	.019 (.012)
Unemployment rate	.073* (.035)	.035 (.039)	.07 (.048)	.03 (.043)	.035 (.044)
Govt. expenditure	-.065*** (.013)	-.065*** (.017)	-.081*** (.016)	-.066*** (.018)	-.068*** (.016)
Corruption control	.022*** (.003)	.023*** (.003)	.022*** (.005)	.024*** (.005)	.022*** (.003)
Education	.009** (.004)	-.001 (.004)	.004 (.004)	-.001 (.004)	.00 (.004)
Investment	.034** (.014)	.022* (.012)	.039*** (.012)	.018 (.012)	.024 (.014)
Property rights	-.039 (.083)	.03 (.106)	.076 (.155)	.064 (.11)	.048 (.108)
Inflation rate	.007 (.006)	.01 (.009)	.016 (.011)	.008 (.007)	.007 (.007)
Freedom to trade int'l	.159** (.056)	.251*** (.058)	.155*** (.044)	.255*** (.048)	.272*** (.067)
Fin. Inst. Dev.	.006 (.006)				
Rem X Fin. Inst. Dev.	.237*** (.044)				
Domestic credit		.006 (.006)			
Rem X Domestic credit		.032*** (.01)			
Lending rate			.006 (.018)		
Rem X Lending rate			-.287** (.102)		
Liquid liability				.01 (.007)	
Rem X Liquid liability				-.007 (.018)	
Bank assets					.001 (.007)
Rem X Bank assets					.035*** (.011)
Constant	-1.432** (.629)	-1.268 (.865)	-1.386 (1.075)	-1.715 (1.259)	-1.419 (1.053)
Observations	527	563	473	548	548
No. of countries	63	66	56	65	65
R-squared	.334	.241	.253	.232	.245
Time FE	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$.

Table 4.11: Estimations with Alternative Dependent Variable - Total Business Density

	(1)	(2)	(3)	(4)	(5)
	TBD	TBD	TBD	TBD	TBD
Remittance	-3.707*** (.661)	.478 (.808)	.662 (1.023)	3.095* (1.504)	.303 (.729)
IMF_FII	.006 (.008)				
Rem * IMF_FII	.092*** (.03)				
Domestic credit		-.019*** (.004)			
Rem * Domestic credit		.027 (.02)			
Liquid liability			-.018*** (.004)		
Rem*Liquid liability			.024* (.013)		
Lending rate				-.056** (.024)	
Rem*Lending rate				-.083* (.041)	
Dep. Money Bank asset					-.018*** (.004)
Rem*Dep_bank asset					.027 (.021)
Constant	-24.962*** (2.811)	-27.167*** (3.061)	-25.482*** (2.777)	-25.079*** (2.042)	-27.033*** (2.911)
Include Controls	YES	YES	YES	YES	YES
Observations	595	629	616	509	616
No. of countries	55	58	57	50	57
R-squared	.442	.43	.426	.476	.43
Time FE	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$

4.3.4 Additional Findings at Income and Regional Levels

Lastly, we present some additional findings in Table 12 for estimations by income and regional groups. Columns (1) to (4) show that the effect of remittances on new business density, conditional on financial development, is significant only in middle-income countries (MIC, LMIC, and UMIC). For low-income countries, the coefficient is positive but insignificant, indicating a difference in the level of financial development between low-income and middle-income countries.

The regional analysis in columns (5) to (8) of Table 12 for Africa, Asia, Europe, and Latin America indicates that remittances are positively associated with formal entrepreneurship in African and European countries with improved financial sectors. Our results indicate a positive but insignificant effect of the interaction term for Latin America and the Caribbean countries. Lastly, the interaction coefficient for Asia indicates remittances substitute for financial sectors in the Asian countries included in our study.

Although this finding is outside our expectations, they imply that the efficiency of financial institutions in Asian countries may preclude the need to rely on remittances for formal entrepreneurship development.

Table 4.12: Regression Results for Different Income Groups and Regions

	Income Groups				Regional Subsamples			
	(1) LIC	(2) MIC	(3) LMIC	(4) UMIC	(5) Africa	(6) Asia	(7) Europe	(8) LAC
Remittance	-7.129 (6.875)	-3.59*** (.561)	-6.9** (3.136)	-4.59*** (.864)	-27.5*** (6.946)	3.091*** (.696)	-2.8 (2.995)	-5.694** (2.453)
IMF_FII	-.017 (.018)	-.022* (.011)	-.058* (.03)	-.026 (.022)	-.144*** (.046)	.015 (.01)	.025 (.025)	-.005 (.023)
Rem*IMF_FII	.936 (.6)	.062*** (.012)	.255** (.085)	.067*** (.017)	.695*** (.206)	-.093*** (.016)	.166* (.079)	.081 (.059)
Constant	-1.445 (1.93)	-14.2*** (4.445)	8.725 (6.845)	-41.9*** (4.188)	-12.887* (6.286)	1.217 (5.29)	-49.4*** (11.487)	-47.5*** (8.309)
Include Controls	YES	YES	YES	YES	YES	YES	YES	YES
Observations	101	735	360	375	325	241	147	123
No. of countries	11	65	33	32	30	22	12	12
R-squared	.811	.15	.185	.315	.28	.296	.621	.485
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$.*

Note: Dependent Variable: New Business Density. LIC – low-income countries, MIC – middle-income countries, LMIC – lower-middle income countries, UMIC – upper-middle income countries, LAC – Latin America and the Caribbean.

4.3.5 Does Financial Market Development Matter?

The overall financial development of a country considers the development of financial institutions such as banks and financial markets, such as the stock and bond markets (Sviryzdenka, 2016). *Therefore, in this section, we question whether financial market development plays a significant role in linking remittances to new businesses in developing countries, as in the case of financial institutions established in the preceding sections.* We predict that early-stage entrepreneurial ventures in developing countries rely more on financial institutions such as banks than on the stock and bond markets for financing. Accordingly, since migrants' remittances are transmitted through banks and not the financial market, the latter's development should not positively influence the use of remittances for entrepreneurship. Thus, remittances and financial markets are substitutes, in contrast to financial institutions.

The preceding prediction is based on the fact that most migrants' remittances are sent directly to left-behind household members. There is little evidence of migrants directly investing in their home countries' stock and bond markets. For instance, although the idea of diaspora bonds – government-backed securities to raise development financing from their

diaspora population – is beginning to gain ground, only a few countries have attempted to explore such funding channels (Rustomjee, 2018). Moreover, diaspora bonds have no direct bearing on enterprise development in the private sector since most of the funds raised are for government expenditure. Thus far, only Israel and India have recorded success in using diaspora bonds to finance development projects (Schneidman et al., 2022). By pioneering the diaspora bond issuance in 1951, Israel had raised over \$46 billion as of 2021, while India raised about \$5.5 billion in 2000. Another success story includes the Nigerian government’s diaspora bond, which raised \$300 million to finance its budget deficit in 2017. Several other countries, such as Egypt, Ethiopia, Indonesia, Greece, Sri Lanka, Moldova, and Kenya, have attempted but failed to record meaningful success through diaspora bonds (Gevorkyan, 2021).

To assess the effectiveness of financial markets, we re-estimate Equation 3 by replacing financial institutions with financial market development (FMD), while all other variables remain as previously defined. Accordingly, we expect the interaction term between remittances and financial market development to be negative, indicating less reliance on remittances to finance formal entrepreneurship in countries with more developed financial markets. Instead, new ventures can easily take their businesses public, thereby encouraging their entrepreneurial development. The IMF’s financial market development index is the primary measure of financial markets. We also use two alternative indicators to measure financial market development: the ratio of stocks traded to GDP and the ratio of stock market capitalization to GDP from the World Bank.

We present the results of the estimations for all three measures of financial market development interacting with remittances in columns (1) to (3) of Table 4.13. Additionally, we include the results for estimations using access to both financial markets and financial institution indicators, which measure how accessible financial markets and institutions are to people in developing countries in columns (4) and (5). For brevity, we present only the results of the main variables, even though all estimations include the same control variables as those in Tables 4.7 and 4.9.

As previously observed, the partial coefficients of remittances, holding other variables fixed, remain insignificant. However, the coefficients of financial markets are positive and significant for the market capitalization ratio and access to financial markets when remittances are at zero. This finding indicates that the development of financial

markets, even in the absence of remittances, can lead to the development of formal entrepreneurship in developing countries. This finding supports the findings of Kar and Özşahin (2016) on the positive association between market capitalization and entrepreneurship in 17 emerging economies and that of Elitcha (2019).

Table 4.13: Estimation Results for Financial Market Development

	Financial Market Indicators			Access to Fin. Development	
	(1) NDB	(2) NDB	(3) NDB	(4) NDB	(5) NDB
Remittances	-.496 (.29)	1.132 (.832)	-1.516 (1.024)	-.37 (.295)	-3.533*** (.859)
Financial market index	.003 (.005)				
Rem X Fin. mrkt. index	-.04*** (.011)				
Market Cap. per GDP		.014** (.005)			
Rem X Market cap.		-.031*** (.006)			
Stocks traded per GDP			.018 (.011)		
Rem X Stocks traded			-.052** (.021)		
Financial market access				.007** (.003)	
Rem X Fin. mrkt. access				-.07** (.031)	
Financial inst. access					-.011* (.006)
Rem X Fin. inst. access					.052*** (.017)
Constant	-12.169*** (2.255)	-7.883 (7.025)	-14.263 (8.943)	-12.902*** (1.761)	-12.066*** (2.552)
Include Control Variables	YES	YES	YES	YES	YES
No. of observations	836	312	311	836	836
No. of countries	76	36	36	76	76
R-squared	.135	.254	.267	.138	.14
Time FE	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; ** $p < .01$, *** $p < .05$, * $p < .1$. Dependent Variable = New Business Density (NBD)*

Next, the interactions between remittances and financial market indicators show negative and significant coefficients at a minimum of the 5% level in columns (1) – (4). We relate this relationship to the nature of migrant remittances. Currently, migrants mainly transfer funds to their kin in their home countries to support their consumption expenditures or finance investments in productive activities. Often, these transfers flow through banks to households or as savings at domestic financial institutions. Although we cannot rule out the possibility that some educated migrants could take advantage of information and communication technology (ICT) to digitally invest in stock markets around the world,

including their home countries, there is currently insufficient evidence to suggest that such investment would encourage early-stage formal entrepreneurship development. Moreover, such investments are conceptually different from the mainstream understanding of remittances.

Lastly, contrary to the findings on financial market indicators, including access to such market as shown in columns (4) and (5) provides further support to the findings in columns (2), (4), (6), (8), and (10) of Tables 4.7 and 4.9 on the mediating role of financial institutions. Column (5) shows that increased access to formal financial services through financial inclusion plays a significant role in facilitating the flow of remittances for formal enterprise development.

4.3.6 Additional Robustness Checks with Alternative Dependent Variable

This section provides additional robustness checks for the preceding findings by employing an alternative dependent variable similar to Table 4.11 and presents the results in Tables 4.14 for financial development measures from the IMF only.

Table 4.14: Robustness Check with Total Business Density as the Dependent Variable

	(1) TBD	(2) TBD	(3) TBD
Remittances	.748 (.953)	.855 (.802)	-3.186*** (.493)
Financial market index	.034*** (.006)		
Rem X Fin. Mrkt. Index	-.069** (.023)		
Financial market access		.019** (.007)	
Rem X Fin. Mrkt. Access		-.074*** (.015)	
Financial inst. Access			.009** (.004)
Rem X Fin. Inst. Access			.072** (.026)
Constant	-23.766*** (2.767)	-25.967*** (2.924)	-20.915*** (2.737)
Include Controls	YES	YES	YES
No. of observations	595	595	595
No. of countries	55	55	55
R-squared	.426	.429	.453
Time FE	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$.

Columns (1) and (2) of Table 4.14 show a negative and significant effect of remittance-financial market interactions on total business density but a positive effect for

financial institutions. These results support the results in Table 4.13 and reinforce our claim that in countries with developed financial markets, remittances are not enterprise-inducing, in contrast to countries with developed financial institutions. Thus, our results are robust and reliable to inform policy guidance.

In summary, this chapter addresses the first objective of this study on the conditional effect of remittances on formal entrepreneurship development in developing countries. Specifically, it shows evidence consistent with the idea that in countries where e-government platforms and financial institutions are developed and deliberately added to the tools a migrant can exploit, migrant-sending countries could unlock the expansion of formal entrepreneurship, which could create jobs, alleviate poverty, and reduce income inequality. The next chapter examines whether the moderating roles of e-government and financial development studied in this chapter can extend to reducing poverty and income inequality in developing countries.

Chapter 5: Conditional Effect of Remittances on Poverty and Income Inequality

5.1 Introduction

This chapter presents and discusses the results from the extended assessment of the role of remittances in reducing poverty and income inequality for a sample of 98 developing countries conditional on e-government development and financial inclusion¹⁸ from 2003 to 2018. The chapter is divided into different subsections, beginning with the role of e-government and financial inclusion as moderators of the remittance-poverty relationship and the remittance-income inequality nexus.

5.2 Remittances, E-government, and Poverty

The estimations in this chapter are based on the empirical model in Equation 6 in Chapter 3, as follows:

$$y_{i,t} = \omega_0 + \omega_1 rem_{i,t} + \omega_2 X_{i,t} + \omega_3 (rem_{i,t} * X_{i,t}) + \omega_4 Z_{i,t} + v_i + \mu_t + \varepsilon_{i,t} \quad (6)$$

where $y_{i,t}$ is a vector of the dependent variables: poverty headcount and income inequality in country i at time t . $rem_{i,t}$ is the primary explanatory variable measured by per capita remittances received in country i ; $X_{i,t}$ is a vector of the moderating variables, namely, e-government and financial inclusion. Z is a vector of control variables drawn from the literature that affect poverty and income inequality, such as GDP growth rate, trade openness, unemployment rate, rural population, corruption, and the shadow economy. v_i , μ_t , and $\varepsilon_{i,t}$ are the country-specific fixed and time effects and the error term, respectively. The data for remittances and poverty are sourced from the World Bank's WDI. E-government (EDGI) and its components, such as the online services index (OSI), telecommunication infrastructure index (TII), human capital index (HCI), and e-participation (EPART), were derived from the E-government Development Index of the United Nations. For financial inclusion, we create a composite index using six indicators from the IMF's Financial Access Survey. A complete description of the other variables is provided in Table A3.3 of the appendix. Finally, it is important to note that the result tables and discussions in this chapter were extracted from Alhassan et al. (2023b).

¹⁸ See Table A5.1 and Figures A5.1 and A5.2 for the summary statistics of the variables used in this section and correlation plots.

Table 5.1 presents the results for the remittance-poverty relationship with e-government as a conditional variable using the fixed effects estimator. The results show that both remittances and e-government (all components, except the human capital index) negatively affect poverty in developing countries. Specifically, remittance per capita is negatively correlated with the poverty headcount ratio, even at the 1% significance level. A 1% increase in remittances reduces poverty by 0.04% to 0.06% in columns (1) to (5), without interaction terms. In other words, for every dollar increase in per capita remittances to developing countries, the poverty headcount ratio drops by about half a percentage point. This finding conforms with the submissions of Combes and Ebeke (2011) and Vacaflores (2018). Remittances are an important financial means for alleviating poverty in receiving countries. Intuitively, receiving remittances augments households' income streams, thereby increasing their daily consumption by more than \$1.90.

We also find a negative correlation between e-government and the poverty headcount ratio for the overall e-government index (EGDI), online services index (OSI), telecommunication infrastructure index (TII), and e-participation (EPART) but a positive association for the human capital index (HCI). Essentially, increasing the components of e-government by 0.01 units reduces poverty by .09, 0.3, 1.3, and 0.3 percentage points for EGDI, OSI, TII, and EPART, respectively. However, the HCI increases poverty by 0.2 for the countries captured in the estimation. The negative coefficients signify that augmenting government public service delivery can improve inclusivity and foster poverty reduction. Such digitalization can speed up the formalization of small and medium enterprises often operated by the poor in developing countries and grant them easier access to government support that could uplift their enterprises and family income. This finding lends credence to the effect of e-government on formal entrepreneurship, as discussed in Section 4.2.

On the control variables, we find trade openness (*trade_index*), income inequality (*gini_index*), unemployment, public sector corruption (*corruption*) and rural population to increase poverty in developing countries. The positive coefficients of trade openness and income inequality are in line with the recent evidence from Tran and Le (2021) and Song et al. (2021). Trade openness may be unfavorable for developing countries, which often rely on the export of extractive, capital-intensive products instead of manufactured goods. Thus, openness only extends competition against local SMEs, increasing poverty in the case of business failure. Next, our finding also shows that the shadow economy offers respite to the

poor, income-disadvantaged and unemployed (Ohnsorge & Yu, 2021). The positive effect of income inequality supports the findings of Gutiérrez-Romero and Ahamed (2021) and Omar and Inaba (2020). Lastly, the positive coefficient of corruption shows that institutionally weak and corruption-ridden environments create avenues for increased poverty (Tebaldi & Mohan, 2010) and economic inefficiencies (North, 1989).

Regarding the moderating role of e-government in the remittance-poverty nexus, the results in columns (6) to (10) of Table 5.1 show significant negative coefficients at the 5% and 1% levels for all measures of e-government, except for TII in column (9). This finding confirms our intuition of the moderating role of e-government in addressing poverty in developing countries. When governments digitalize and extend their services, such as consultancy, raising development finance, and entrepreneurial ecosystem development to the diaspora, the inflow of remittances can be appropriately channeled towards avenues with greater poverty reduction potential. This finding is crucial in designing policies that affect the use of remittances in developing countries. Therefore, this study presents a *prima facie* case of how digitalizing government services can link migrants' remittances to poverty reduction in developing countries.

Next, the preceding findings are re-estimated using the two-stage fixed effects technique (TSFE) to address the potential endogeneity of remittances using the percentage of people with access to the internet and the lag of remittances as instruments. For brevity, the results are shown in Table 5.2 for only the models with interaction terms. The results show that the magnitudes of the coefficients of the interaction terms are about twice those of Table 5.1. However, the negative impact of the interaction between remittances and e-government on poverty remains significant at the 1% level. Moreover, the endogeneity test in Table 5.2 confirms that remittances and the interaction terms are generally endogenous, as the p-values of endogeneity are less than 5%. Furthermore, the Sargan-Hansen over-identification, Kleibergan-Paap under-identification, and Cragg-Donald weak identification tests confirm the significance of our instruments. Hence, correcting for endogeneity provides a robustness check for our earlier findings on the negative interactive impact of remittances and e-government on poverty reduction in developing countries.

Table 5.1: Remittances, E-government, and Poverty - Fixed Effects

	Without Interaction Terms					With Interaction Terms				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent variables: Log of Poverty Headcount at \$1.90					Dependent variables: Log of Poverty Headcount at \$1.90				
Remittances	-.0436*** (.0072)	-.047*** (.0074)	-.0558*** (.0097)	-.0539*** (.0096)	-.0512*** (.0093)	.0744*** (.0167)	.0035 (.0084)	.0813 (.0454)	-.0476*** (.0076)	-.0312*** (.0092)
EGDI	-.964*** (.2063)					.6782** (.2462)				
Rem X EGDI						-.3924*** (.0974)				
OSI		-.3508** (.1056)					.7996*** (.1612)			
Rem X OSI							-.2673*** (.0656)			
HCI			.2363** (.099)					.92** (.3092)		
Rem X HCI								-.2178** (.0868)		
TII				-1.326*** (.2973)					-1.039*** (.1544)	
Rem X TII									-.0654 (.0685)	
EPART					-.2836* (.1317)					.4756** (.1698)
Rem X EPART										-.1713*** (.0442)
GDP_growth	.0006 (.0052)	.0018 (.0049)	.0027 (.0049)	-.0024 (.0045)	.0013 (.0051)	-.0013 (.0037)	.0007 (.0038)	.0012 (.0039)	-.0023 (.0045)	.0013 (.0042)
Trade_index	.0123*** (.0018)	.0123*** (.0017)	.0122*** (.0017)	.0125*** (.0017)	.0123*** (.0016)	.0131*** (.0019)	.0137*** (.0022)	.0112*** (.0012)	.0128*** (.002)	.0143*** (.0021)
Gini_index	.0513*** (.003)	.0507*** (.0029)	.0505*** (.0028)	.0452*** (.0036)	.0499*** (.0027)	.0458*** (.0034)	.0446*** (.0035)	.0513*** (.003)	.0446*** (.004)	.0452*** (.0034)
Unemployment	.0348*** (.0044)	.036*** (.0041)	.0356*** (.0044)	.0327*** (.0054)	.0355*** (.0045)	.0328*** (.0049)	.0339*** (.0046)	.033*** (.0051)	.0329*** (.0051)	.0338*** (.0052)
Corruption	.2487* (.1265)	.2409* (.1257)	.2512* (.1335)	.2501* (.1211)	.2399 (.1297)	.1538 (.1221)	.1921 (.1189)	.195 (.128)	.2349* (.1261)	.204 (.1123)
Rural population	.016** (.0057)	.0158** (.0061)	.0166** (.0059)	.0151** (.0054)	.0154** (.0058)	.0173** (.0059)	.0157* (.0071)	.0182*** (.0053)	.0154** (.0052)	.0161** (.0065)
Shadow economy	-.0052 (.0036)	-.0103* (.0046)	-.0094* (.0043)	-.0033 (.0035)	-.0095* (.005)	-.0017 (.0028)	-.0046 (.0035)	-.0099** (.0038)	-.002 (.0028)	-.0021 (.0035)
Constant	-.9886** (.3665)	-.9839** (.3933)	-1.27*** (.3233)	-.8764* (.4534)	-.9772** (.4141)	-1.35*** (.3617)	-1.11** (.4255)	-1.69*** (.2593)	-.9495** (.3936)	-1.199** (.3686)
Observations	680	680	680	680	680	680	680	680	680	680
No. of countries	94	94	94	94	94	94	94	94	94	94
R-squared	.6532	.6492	.6436	.6651	.649	.6712	.6682	.6499	.6657	.6612
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Table 5.2: Remittances, E-government, and Poverty - Two-Stage Fixed Effects

	(1)	(2)	(3)	(4)	(5)
	Dependent variables: Log of Poverty Headcount at \$1.90				
Remittances	.2347*** (.0783)	.0827* (.0494)	.1651 (.1441)	.0864 (.0829)	-.0079 (.038)
EGDI	3.0954*** (1.0433)				
Remittances X EGDI	-.9214*** (.2431)				
OSI		3.42*** (.8269)			
Remittances X OSI		-.8474*** (.1953)			
HCI			1.2146 (.7604)		
Remittances X HCI			-.3206 (.2165)		
TII				7.4353** (3.3769)	
Remittances X TII				-1.79*** (.6599)	
EPART					3.2195*** (1.1472)
Remittances X EPART					-.785*** (.2693)
GDP growth rate	-.0023 (.0039)	.0003 (.0041)	.0011 (.004)	.0008 (.0071)	.0036 (.0053)
Trade globalization index	.0134*** (.0026)	.0158*** (.0031)	.0096*** (.0025)	.0207*** (.0053)	.0202*** (.0047)
Gini index	.0364*** (.0068)	.031*** (.0075)	.0495*** (.0064)	.0279** (.0111)	.0294*** (.0095)
Unemployment rate	.0342*** (.0072)	.0333*** (.008)	.0313*** (.0075)	.0456*** (.0117)	.0328*** (.0092)
Corruption	.0957 (.181)	.1658 (.2122)	.2024 (.1671)	-.1144 (.2951)	.1267 (.2426)
Rural population	.0167 (.0119)	.0144 (.013)	.0156 (.0118)	.0217 (.0156)	.0184 (.0156)
Shadow economy	.0087 (.0104)	.0104 (.0111)	-.0044 (.0101)	.0398* (.0207)	.0242 (.0149)
Observations	654	654	654	654	654
No. of countries	90	90	90	90	90
R-squared	.6428	.5715	.6471	.289	.4887
Sargan-Hansen – overidentification	3.6867	1.5282	21.2245	.0344	5.7196
Sargan-Hansen Pvalue	.0548	.2164	.0000	.8528	.0168
Anderson - underidentification	46.6698	35.0137	66.5326	13.5299	11.991
Pvalue of underidentification test	.0000	.0000	.0000	.0000	.0025
Crag-Donald - Weak identification	27.1143	16.4958	32.743	6.1151	7.1488
Endogeneity Test (Chi2)	7.0364	13.3052	1.4943	16.6517	10.8816
P-value of endogeneity	.0297	.0013	.4737	.0002	.0043
Time FE	YES	YES	YES	YES	YES

Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

5.3 Remittances, Financial Inclusion, and Poverty

Turning to the findings of the model with financial inclusion as the conditional variable. Table 5.3 presents the results from the fixed effect and two-stage fixed effect estimations. In columns (1) and (2) for fixed effect, the results show that remittances and the composite financial inclusion index negatively affect poverty in developing countries. The explanation of the direct effect of remittances on poverty in Table 5.1 still holds. The negative relationship between financial inclusion and poverty aligns with several studies (Gutiérrez-Romero & Ahamed, 2021; Omar & Inaba, 2020; Park & Mercado, 2018; Saha & Qin, 2022; Tran & Le, 2021) on developing countries. This result implies that being financially included allows one to save and access credit from formal financial institutions for productive investment.

The interaction between remittances and financial inclusion is negative and insignificant for the fixed effects model but significant when corrected for endogeneity using the TSFE. The result suggests that reducing poverty in remittance-receiving countries may be accompanied by financial inclusion strategies. This strategy offers several advantages. For instance, remittance-receiving households can easily receive remittance transfers through formal channels and engage in savings through formal financial institutions. This will expose them to formal credit channels essential for poverty reduction and make investment credit available for financially included non-remittance households.

Our findings show that e-government and financial inclusion are important strategies to address poverty in developing countries that receive international remittances. For ease of interpretation, we present the marginal effects of remittances on poverty headcount conditional on the levels of e-government and financial inclusion from the fixed-effect estimations in Table 5.4 and Figure 5.1. Notably, as both the e-government and financial inclusion measures increase, the impact of remittances on poverty becomes increasingly negative, signifying the magnifying role of both moderating variables.

Table 5.3: Remittance, Financial Inclusion, and Poverty – FE and TSFE

Dependent Variable: Log of Poverty Headcount \$1.90

	Fixed Effect		Two-stage fixed effect	
	(1)	(2)	(3)	(4)
Remittances	-.0269*** (.0076)	-.0196 (.0116)	-.0181 (.0254)	.0773 (.0635)
E-government (EGDI)	-.7498*** (.1992)	-.7174*** (.1633)	-.7246** (.3067)	-.1379 (.3656)
Financial inclusion	-.3644** (.1064)	-.1397 (.3278)	-.3075 (.195)	3.3321** (1.6077)
Rem X Financial inclusion		-.0497 (.0779)		-.8085** (.3459)
GDP growth rate	-.0049 (.0043)	-.0049 (.0043)	-.0049 (.0041)	-.0045 (.0046)
Trade globalization index	.0114*** (.0021)	.0117*** (.0026)	.0099*** (.0026)	.0155*** (.0042)
Gini index	.0527*** (.0037)	.0521*** (.0033)	.0523*** (.0074)	.0436*** (.0086)
Unemployment rate	.0376*** (.0047)	.0379*** (.0041)	.0361*** (.0076)	.0436*** (.0098)
Corruption	.307 (.1654)	.2897 (.1584)	.315* (.1906)	.1292 (.2556)
Rural population	.0092 (.0065)	.0091 (.0066)	.0064 (.0112)	.0076 (.0128)
Shadow economy	.0007 (.0035)	.0015 (.0031)	.0038 (.0099)	.0168 (.0134)
Constant	-1.0449** (.3013)	-1.09*** (.2676)		
Observations	589	589	568	568
No. of Countries	93	93	89	89
R-squared	.6388	.6393	.6373	.502
Sargan-Hansen - overidentification	-	-	8.0589	.8895
Sargan-Hansen P-value	-	-	.0178	.3456
Anderson underidentification test	-	-	27.3382	19.3559
Pvalue of underidentification test	-	-	.00	.0001
Crag-Donald - Weak identification	-	-	126.4777	7.1824
Endogeneity Test (Chi2)	-	-	.0337	5.6011
P-value of endogeneity	-	-	.8544	.0608
Time FE	YES	YES	YES	YES

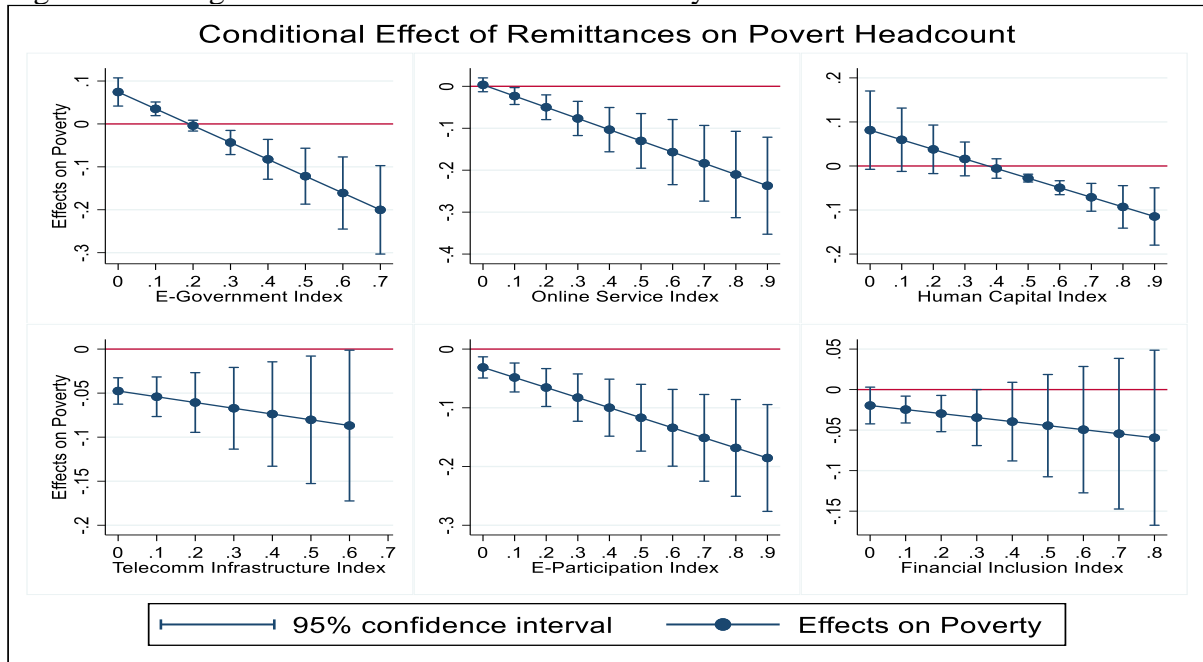
Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Table 5.4: Marginal Effect of Remittances on Poverty by E-government and Fin. Inc.

Values	(1) EGDI	(2) OSI	(3) HCI	(4) TII	(5) EPART	(6) FII
0	0.074*** (0.017)	0.004 (0.008)	0.081 (0.045)	-0.048*** (0.008)	-0.031*** (0.009)	-0.02 (0.012)
0.1	0.035*** (0.008)	-0.023* (0.01)	0.06 (0.037)	-0.054*** (0.011)	-0.048*** (0.013)	-0.025** (0.008)
0.2	-0.004 (0.006)	-0.05** (0.015)	0.038 (0.028)	-0.061*** (0.017)	-0.066*** (0.016)	-0.03** (0.011)
0.3	-0.043** (0.014)	-0.077*** (0.021)	0.016 (0.02)	-0.067** (0.024)	-0.083*** (0.021)	-0.035* (0.018)
0.4	-0.083*** (0.024)	-0.103*** (0.027)	-0.006 (0.011)	-0.074** (0.03)	-0.1*** (0.025)	-0.04 (0.025)
0.5	-0.122*** (0.033)	-0.13*** (0.033)	-0.028*** (0.005)	-0.08* (0.037)	-0.117*** (0.029)	-0.044 (0.032)
0.6	-0.161*** (0.043)	-0.157*** (0.04)	-0.049*** (0.008)	-0.087* (0.044)	-0.134*** (0.033)	-0.049 (0.04)
0.7	-0.2*** (0.053)	-0.184*** (0.046)	-0.071*** (0.016)		-0.151*** (0.038)	-0.054 (0.047)
0.8		-0.21*** (0.053)	-0.093*** (0.025)		-0.168*** (0.042)	-0.059 (0.055)
0.9		-0.237*** (0.059)	-0.115*** (0.033)		-0.185*** (0.046)	
Obn.	680	680	680	680	680	589

Notes: Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 5.1: Marginal Effect of Remittances on Poverty Plots



Source: Authors' computation from Fixed Effect results

5.4 Remittances, E-government, and Income Inequality

We now turn to the analysis of income inequality and present the results in Table 5.5 for remittances and e-government. Columns (1) to (5) show that remittances positively influence income inequality, albeit with small magnitudes. The effect of a 1% increase in per capita remittances on inequality ranges from 0.002% in column (4) to 0.004% in column (2). This finding is intuitive and agrees with the argument that remittances only raise the income of households with migrants or those that receive remittances (Adams, 1989; Rodriguez, 1998). Migration and the resultant remittances are often based on individuals' self-selection. As only those who can afford the cost of international migration can do so, remittances tend to flow mainly to households with such migrants. Thus, households with migrant members within a country are likely to have higher incomes than those without migrants, *ceteris paribus*.

On the other hand, e-government shows a consistent effect of reducing income inequality in developing countries, and the coefficients are significant at the 1% level for all components except the human capital index (HCI). This finding shows that the digitalization of government services makes the government more inclusive and allows it to reach everyone by efficiently distributing income or providing avenues for equal access to opportunities. However, this claim depends on the extent of the digital divide within a country.

Regarding the control variables, we find that economic growth rate, unemployment, public-sector corruption, and the shadow economy have positive and significant correlations with income inequality, while the percentage of the rural population exhibits a negative correlation. The positive correlation between economic growth and inequality may ensue when the sources of growth are from the skill-intensive sectors of the economy. In this case, most unskilled individuals may not benefit directly from growth, thereby increasing inequality. Moreover, even when income levels rise for all income groups, but with a greater magnitude for the top income group, the extent of inequality may still be observed. Similarly, the unemployment rate expands income inequality, especially as social welfare services such as unemployment benefits are uncommon in developing countries. Furthermore, even when the poor and the unemployed engage in informal economic activities, their incomes may not rise quickly enough to close the income gap with the rich. The result for the rural population is unexpected because it is assumed that a higher rural population may increase income inequality. We suspect that this could happen only when rural dwellers engage in commercial farming and are connected to a broader market, or when rural development is prioritized.

Table 5.5: Remittances, E-government, and Income Inequality – Fixed Effects

	Without Interaction Terms					With Interaction Terms				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent variable: Log of income inequality (Gini index)					Dependent variable: Log of income inequality (Gini index)				
Remittances	.0035*** (.0008)	.0036*** (.0007)	.0027*** (.0008)	.0021* (.001)	.0032*** (.0009)	.0194*** (.0015)	.0101*** (.0015)	-.0042 (.0118)	.0042** (.0017)	.0061*** (.0013)
EGDI	-.0761*** (.015)					.1419*** (.0224)				
Rem X EGDI						-.0536*** (.0052)				
OSI		-.0396*** (.0075)					.1042*** (.0104)			
Rem X OSI							-.034*** (.0037)			
HCI			.0566 (.0564)					.0265 (.0351)		
Rem X HCI								.0109 (.0188)		
TII				-.2344*** (.0327)					-.111* (.0516)	
Rem X TII									-.0237*** (.0041)	
EPART					-.0392*** (.0074)					.0848*** (.0058)
Rem X EPART										-.0276*** (.0027)
GDP_growth	.002*** (.0003)	.0021*** (.0003)	.0021*** (.0003)	.0012** (.0004)	.002*** (.0003)	.0017*** (.0003)	.0019*** (.0003)	.0022*** (.0003)	.0013*** (.0003)	.002*** (.0003)
Trade_index	-.0003 (.0003)	-.0003 (.0003)	-.0003 (.0004)	-.0001 (.0003)	-.0002 (.0003)	-.0001 (.0003)	.00 (.0003)	-.0003 (.0003)	.00 (.0003)	.00 (.0003)
Unemployment	.0017*** (.0003)	.0018*** (.0003)	.0016*** (.0004)	.0008 (.0005)	.0017*** (.0003)	.0013** (.0004)	.0014*** (.0004)	.0017*** (.0003)	.0009 (.0005)	.0014** (.0004)
Corruption	.0126* (.006)	.0108 (.0062)	.0123** (.0053)	.0137* (.0063)	.0093 (.0059)	-.0042 (.0087)	-.0016 (.0079)	.0145** (.0053)	.007 (.0063)	-.002 (.0072)
Rural population	-.0033*** (.0006)	-.0034*** (.0006)	-.0033*** (.0007)	-.0033*** (.0005)	-.0035*** (.0006)	-.0029*** (.0007)	-.0031*** (.0007)	-.0033*** (.0006)	-.0031*** (.0006)	-.0031*** (.0007)
Shadow economy	.0039*** (.0001)	.0037*** (.0001)	.0035*** (.0001)	.0042*** (.0001)	.0038*** (.0002)	.0043*** (.0003)	.0043*** (.0003)	.0036*** (.0002)	.0046*** (.0003)	.0046*** (.0003)
Observations	828	828	828	828	828	828	828	828	828	828
No. of countries	98	98	98	98	98	98	98	98	98	98
R-squared within	.2378	.2388	.2348	.2838	.2411	.263	.2643	.236	.2892	.2658
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Columns (6)–(10) of Table 5.5 show the results of the moderating role of e-government development. The findings show that the interaction terms are negative and significant across all columns, except for HCI in column (8). This means that when governments employ digital means to connect with their diaspora population, measures can be marshalled to address inequality by steering migrants' remittances towards avenues that will affect income distribution. This could be achieved by promoting entrepreneurship and development projects in rural areas.

Next, we address the possible endogeneity with respect to remittances using TSFE regression and present the results of the models with interaction terms in Table 5.6. The results add weight to the fixed effects. Although most of the control variables are insignificant, the interaction term of interest shows that remittances negatively affect income inequality in countries with better e-government development.

5.5 Remittances, Financial Inclusion, and Income Inequality

Table 5.7 shows the estimated results for the income inequality model, with financial inclusion as a conditional variable for the effectiveness of remittances. The fixed effects results show that while remittances still increase income inequality in developing countries, financial inclusion tends to reduce income inequality. The financial inclusion result confirms previous studies' findings (Omar & Inaba, 2020; Park & Mercado, 2018). However, the interaction term shows that, with better financial inclusion, the positive impact of remittances on income inequality declines and becomes negative. This finding is important because it suggests that the income gap between remittance recipients and non-recipients can be closed through extensive financial inclusion. For instance, recipients will have easier means of saving in formal financial institutions, and non-recipients can affordably access credit for productive investments. This result does not conform with Inoue (2018) and Ofori et al. (2022), who find that financial development worsens the effect of remittances on poverty and income inequality. The findings of this study provide a better direction because they use a measure of financial inclusion that focuses on the actual users of financial services.

The results from the TSFE regressions in Table 5.7 lend support to those of the fixed effects and improve the reliability of financial inclusion as an important strategy for regulating the impact of remittances on income inequality. For clarity, the marginal effects of remittances on income inequality, conditional on the values of e-government and financial inclusion, are presented in

Table 5.8 and Figure 5.2. Again, as e-government development and financial inclusion improve, remittances negatively influence income inequality. This relationship holds for all components of e-government except for the human capital index, which is positive but generally insignificant.

Table 5.6: Remittances, E-government, and Income Inequality - Two-Stage Fixed Effect

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Log of income inequality (Gini index)				
Remittances	.0735*** (.0121)	.0285*** (.007)	.0418* (.0228)	.0243*** (.0089)	.0099* (.0051)
EGDI	.9503*** (.1602)				
Remittances X EGDI	-.2375*** (.0395)				
OSI		.66*** (.1244)			
Remittances X OSI		-.162*** (.0298)			
HCI			.2533** (.1134)		
Remittances X HCI			-.0553 (.0344)		
TII				1.3601*** (.4544)	
Remittances X TII				-.308*** (.0895)	
EPART					.7161*** (.1562)
Remittances X EPART					-.1674*** (.0358)
GDP growth rate	.0014 (.0011)	.0019* (.0011)	.002* (.0012)	.0021* (.0013)	.0026** (.0012)
Trade globalization index	.0006 (.0005)	.0009 (.0006)	-.0005 (.0004)	.0013 (.0008)	.0015** (.0007)
Unemployment rate	.0002 (.0015)	.0001 (.0015)	.0004 (.0014)	.0018 (.0019)	-.0003 (.0017)
Corruption	-.0373 (.0317)	-.0246 (.0342)	.0104 (.0257)	-.056 (.0421)	-.0412 (.042)
Rural population	-.0005 (.0014)	-.0007 (.0015)	-.002** (.001)	.0003 (.002)	.0001 (.0018)
Shadow economy	.004** (.0018)	.0045** (.0019)	.0016 (.0015)	.0076*** (.0026)	.0063*** (.0023)
Observations	792	792	792	792	792
R-squared	-.0133	-.1591	.186	-.6229	-.4856
No. of countries	97	97	97	97	97
Sargan-Hansen -overidentification	.8775	2.2076	32.609	.1987	2.0186
Sargan-Hansen Pvalue	.3489	.1373	.000	.6558	.1554
Anderson – underidentification	50.884	43.8658	72.4257	18.52	29.1722
Pvalue of underidentification test	.000	.000	.000	.0001	.000
Crag-Donald – Weak identification	46.556	29.6323	29.5254	7.1891	16.8272
Endogeneity Test (Chi2)	31.6119	29.4519	3.2051	20.267	30.6318
P-value of endogeneity	.000	.000	.2014	.000	.000
Time FE	YES	YES	YES	YES	YES

Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Table 5.7: Remittances, Financial Inclusion, and Income Inequality – FE and TSFE
 Dependent Variable: Log of Gini_index

	Fixed Effect		Two-stage fixed effect	
	(1)	(2)	(3)	(4)
Remittances	.002* (.0009)	.0053* (.0026)	.005 (.0035)	.0275*** (.01)
E-government	-.0792*** (.0209)	-.0642*** (.0163)	-.069 (.0446)	.0682 (.0511)
Financial inclusion	-.0719*** (.0113)	.0351 (.0298)	-.0616** (.0268)	.8597*** (.1881)
Remittance X Financial Inclusion		-.0241*** (.0056)		-.2091*** (.0433)
GDP growth rate	.002*** (.0005)	.0021*** (.0005)	.0023* (.0012)	.0031** (.0012)
Trade globalization index	.00 (.0004)	.0001 (.0004)	-.0001 (.0005)	.0011 (.0007)
Unemployment rate	.0013*** (.0003)	.0013*** (.0004)	.0009 (.0015)	.0017 (.0019)
Corruption	.0225** (.0087)	.013 (.0086)	.0291 (.0267)	-.0276 (.0374)
Rural population	-.0037*** (.0007)	-.0035*** (.0007)	-.003** (.0013)	-.0006 (.0019)
Shadow economy	.005*** (.0002)	.0054*** (.0004)	.0039** (.002)	.0072*** (.0025)
Constant	3.8736*** (.0154)	3.8292*** (.0326)		
Observations	715	715	689	689
No. of countries	98	98	97	97
R-squared	.2669	.2757	.2578	-
Sargan-Hansen – overidentification	-	-	31.154	.6658
Sargan-Hansen P-value	-	-	.00	.4145
Anderson test of underidentification	-	-	34.6101	33.2717
Pvalue of underidentification test	-	-	.00	.00
Crag-Donald – Weak identification	-	-	196.6462	21.296
Endogeneity Test (Chi2)	-	-	1.1429	34.3944
P-value of endogeneity	-	-	.285	.00
Time Dummies	YES	YES	YES	YES

Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Overall, the findings on the positive impact of remittances on income inequality and the negative impact on poverty are not controversial. Instead, increasing income inequality may indicate an increase in income for remittance households relative to non-remittance households with similar economic status *ab initio*. However, receiving remittances raises recipients' incomes and reduces the number of people living in poverty. This is similar to the submission by Chong

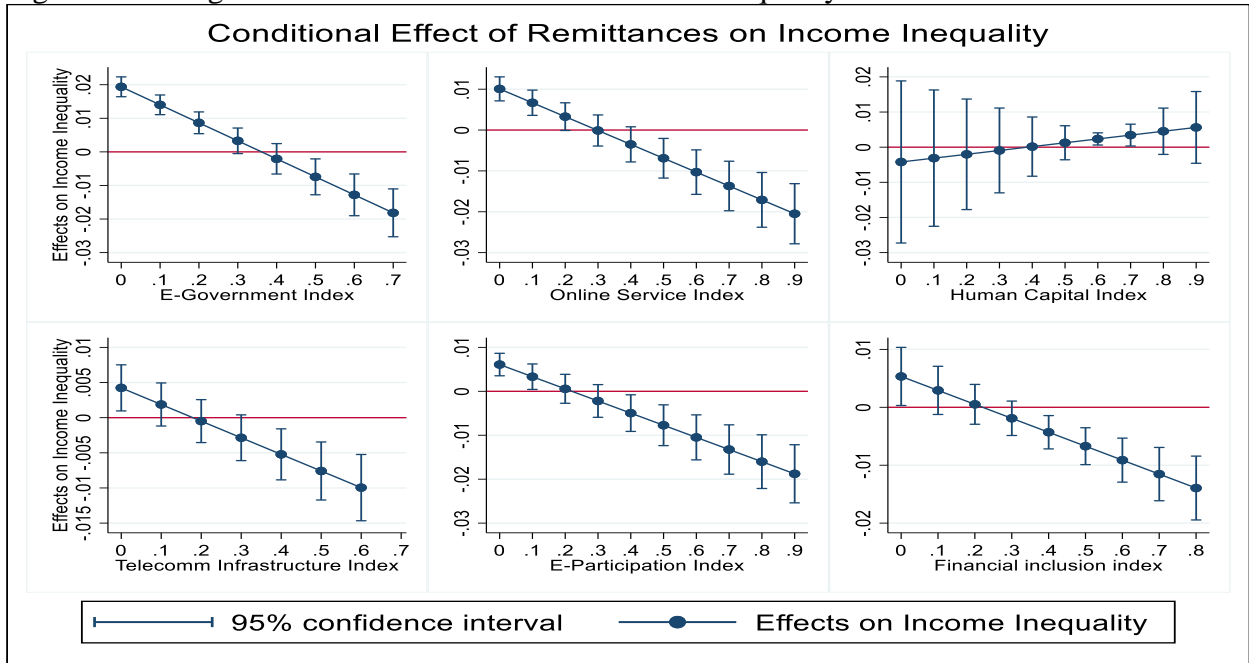
and Calderón (2000) that “poverty may well decrease despite the worsening distribution of income, provided that the income share of the richer groups of the society increases by a larger proportion than that of the poorer groups” (P. 124). The findings of this chapter suggest that the governments of migrant-sending countries could play key roles in alleviating poverty and income inequality by using digital infrastructure to improve the effectiveness of international remittances. These findings confirmed the second objective of this study. The next chapter focuses on the link between remittances, labor supply, and entrepreneurship in Nigeria, in line with the third objective of this study.

Table 5.8: Marginal Effect of Remittances on Income Inequality by E-government and Fin. Inc.

Values	(1) EGDI	(2) OSI	(3) HCI	(4) TII	(5) EPART	(6) FII
0	0.019*** (0.002)	0.01*** (0.001)	-0.004 (0.012)	0.004** (0.002)	0.006*** (0.001)	0.005* (0.003)
0.1	0.014*** (0.001)	0.007*** (0.002)	-0.003 (0.01)	0.002 (0.002)	0.003* (0.001)	0.003 (0.002)
0.2	0.009*** (0.002)	0.003* (0.002)	-0.002 (0.008)	.000 (0.002)	0.001 (0.002)	0.001 (0.002)
0.3	0.003 (0.002)	.000 (0.002)	-0.001 (0.006)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.002)
0.4	-0.002 (0.002)	-0.004 (0.002)	.000 (0.004)	-0.005** (0.002)	-0.005** (0.002)	-0.004** (0.001)
0.5	-0.007** (0.003)	-0.007** (0.002)	0.001 (0.002)	-0.008*** (0.002)	-0.008** (0.002)	-0.007*** (0.002)
0.6	-0.013*** (0.003)	-0.01*** (0.003)	0.002** (0.001)	-0.01*** (0.002)	-0.01*** (0.003)	-0.009*** (0.002)
0.7	-0.018*** (0.004)	-0.014*** (0.003)	0.003* (0.002)		-0.013*** (0.003)	-0.012*** (0.002)
0.8		-0.017*** (0.003)	0.005 (0.003)		-0.016*** (0.003)	-0.014*** (0.003)
0.9		-0.02*** (0.004)	0.006 (0.005)		-0.019*** (0.003)	
Obn.	828	828	828	828	828	715

Notes: Robust standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 5.2: Marginal Effect of Remittances on Income Inequality Plots



Source: Authors' computation from Fixed Effect results

Chapter 6: Remittances, Labor Supply, and Entrepreneurship in Nigeria

6.1 Introduction

This chapter focuses on the relationships between international remittances, labor supply, and household entrepreneurship in Nigeria. The discussions here are corollary to the theoretical and empirical literature reviewed in Section 2.5 of Chapter 2 and the analytical framework discussed in Section 3.3 of Chapter 3. This chapter is divided into two sections: Section 6.2 presents the stylized facts on the Nigerian labor force, migration, and remittances, while Section 6.3 discusses the empirical findings based on Section 3.3 of Chapter 3¹⁹.

6.2 Stylized Facts: Labor Force, Migration, and Remittances in Nigeria

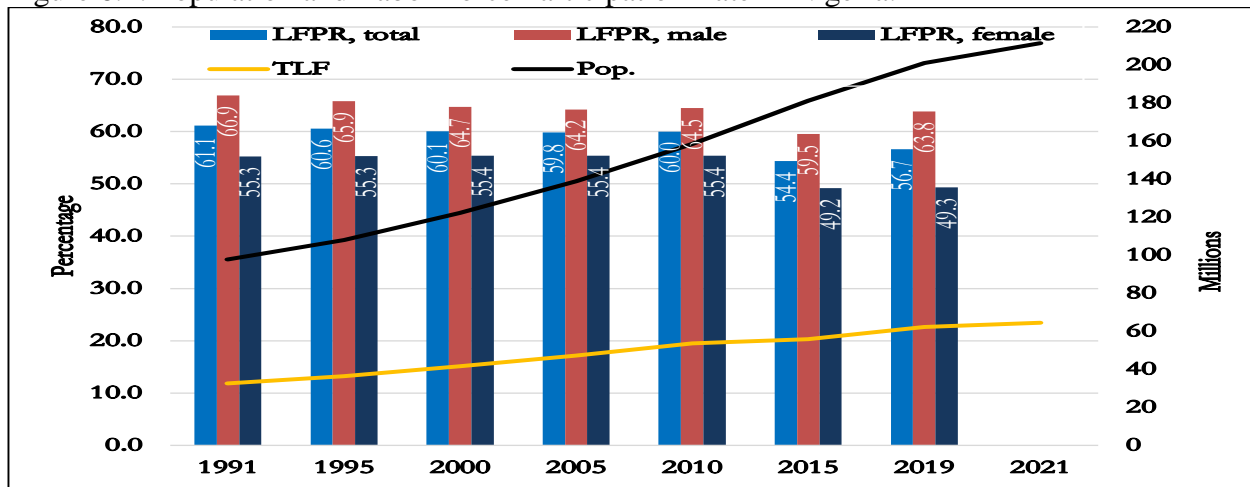
Being the most populous country in Africa and the 7th in global ranking with over 200 million people, Nigerian labor force statistics are often presented with grim realities. Broadly, the number of people in the labor force has increased from around 30 million in 1991 to 64 million in 2021 (Figure 6.1). However, compared to the working-age population, the labor force participation rate (LFPR) shows a slight drop from 61.1% in 1991 to 56.7% in 2019, as shown in Figure 6.1. Similarly, both male (LFPR_male) and female (LFPR_female) labor force participation rates dropped by 3.1 and 6 percentage points, respectively. These changes indicate the possible exit of some Nigerians from the labor force. Adhikari et al. (2021) show that approximately 20 million Nigerians opted out of the active labor force between 2018 and 2020, partly due to the COVID-19 pandemic. Furthermore, the large youth population (15 and 34 years old), which accounts for over 70% of the total population and supposedly the country's future, faces cruel economic conditions that make it difficult to live comfortably.

Next, the percentage of the active labor force that is unemployed has increased in recent years. For instance, data from the International Labor Organization (ILO) in Figure 6.2, show that the unemployment rate has increased from 3.8% in 2010 to 9.8% in 2021. However, this is a shadow of the figure reported by the National Bureau of Statistics (NBS) of Nigeria, which considers those working less than 20 hours per week unemployed (NBS, 2016). The figures show that unemployment has increased from 6.4% in 2014 to 33.3% in 2020. The joblessness witnessed

¹⁹ The figures, tables, and discussion of findings in this Chapter are culled from my unpublished manuscript on remittances and labor force participation in Nigeria (Alhassan, 2023).

in Nigeria further cuts across multiple categories. As figure 6.3 shows, females were about 4% points more unemployed compared to men in the fourth quarter of 2020. Among the educated, 27.8% of master's degree holders were unemployed, whereas 16.9% of PhD holders were affected. First-degree holders were the most affected, with 40.1% unemployed, indicating that four out of every ten graduates did not find suitable jobs. While job availability may be inadequate, it is also argued that the poor status of the tertiary education system produces graduates without the required skills demanded by employers, thus resulting in "brain waste" (Adhikari et al., 2021). For most Nigerians, addressing unemployment ranks 3rd after the management of the economy and insecurity on the list of things they would want the government to do (Afrobarometer, 2022). However, years of government efforts to reduce unemployment have yielded no positive outcomes.

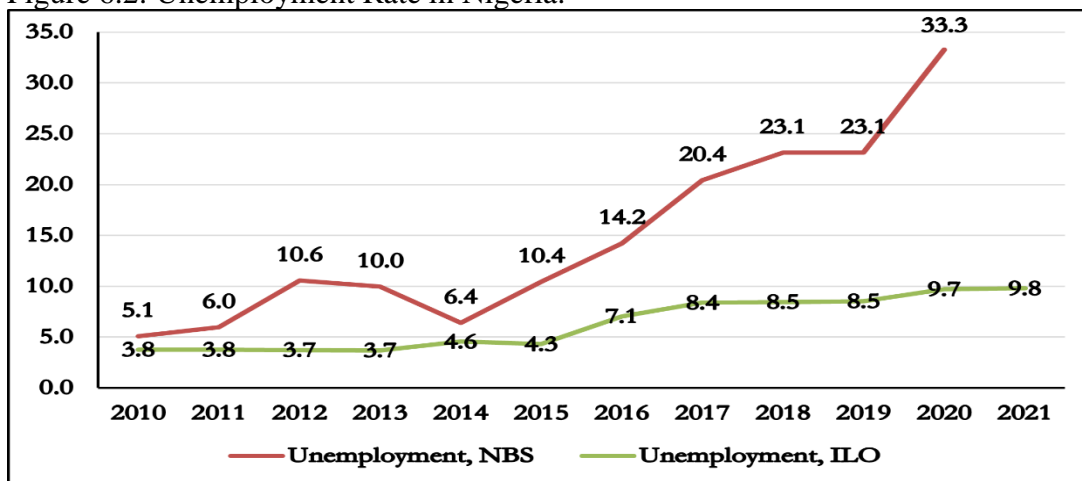
Figure 6.1: Population and Labor Force Participation Rate in Nigeria.



Note: All bars for labor force participation rate are in percentages of population aged 15-64

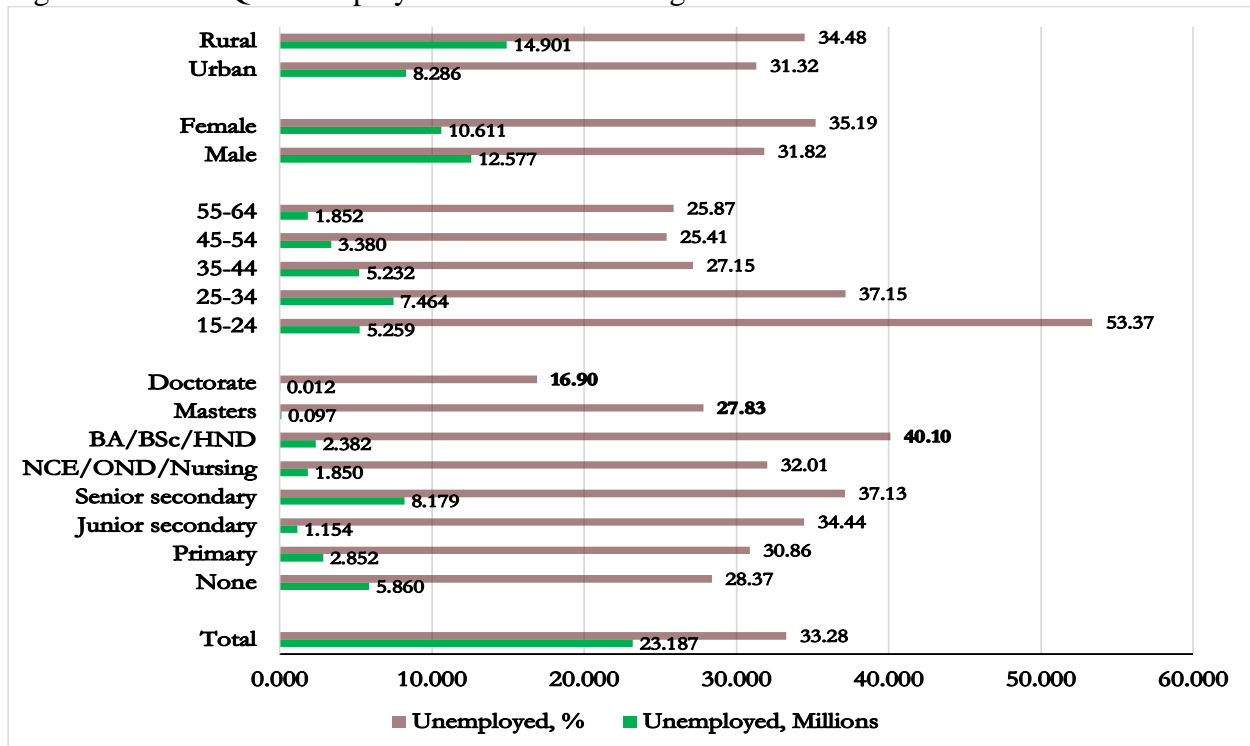
Source: WDI, World Bank (2022)

Figure 6.2: Unemployment Rate in Nigeria.



Source: WDI, World Bank (2022); NBS (2021)

Figure 6.3: 2020 Q4 Unemployment Statistics in Nigeria.



Source: Data from National Bureau of Statistics (2021)

The increasing joblessness, income inequality, poverty, and insecurity in the country may partly explain the rising emigration rate from Nigeria, even among skilled individuals. The Afrobarometer (2017) report indicates that approximately 36% of Nigerians were interested in emigrating to evade the harsh realities of the country. Table 6.1 shows that 610,130 Nigerians emigrated in 2000. Two decades later, emigration increased by more than one million individuals. In 2020, the USA remained the primary destination of most Nigerian migrants, followed by the UK. Interestingly, the migration trend is not limited to men only. In the USA, the UK, Cameroon, Benin, Canada, Cote d'Ivoire, and Niger, women account for more than 48% of all migrants. Since most migrations to the USA, UK, and Canada are based on a lottery, skills, or higher education, one may consider westward migration as a brain drain. However, although the emigration rate is rapidly rising, it is still below 1% of Nigeria's population in 2020.

One of the positive outcomes of emigration from Nigeria is the sizeable amount of remittances transferred to the country by those in the diaspora. As shown in Figure 6.4, remittances to Nigeria have been larger and more stable than FDI and ODA combined since 2005. Furthermore, Nigeria's remittance receipt increased from US\$2 billion in 2004 to about US\$25 billion in 2019, indicating an increase of over US\$20 billion before the COVID-19 pandemic. However, like

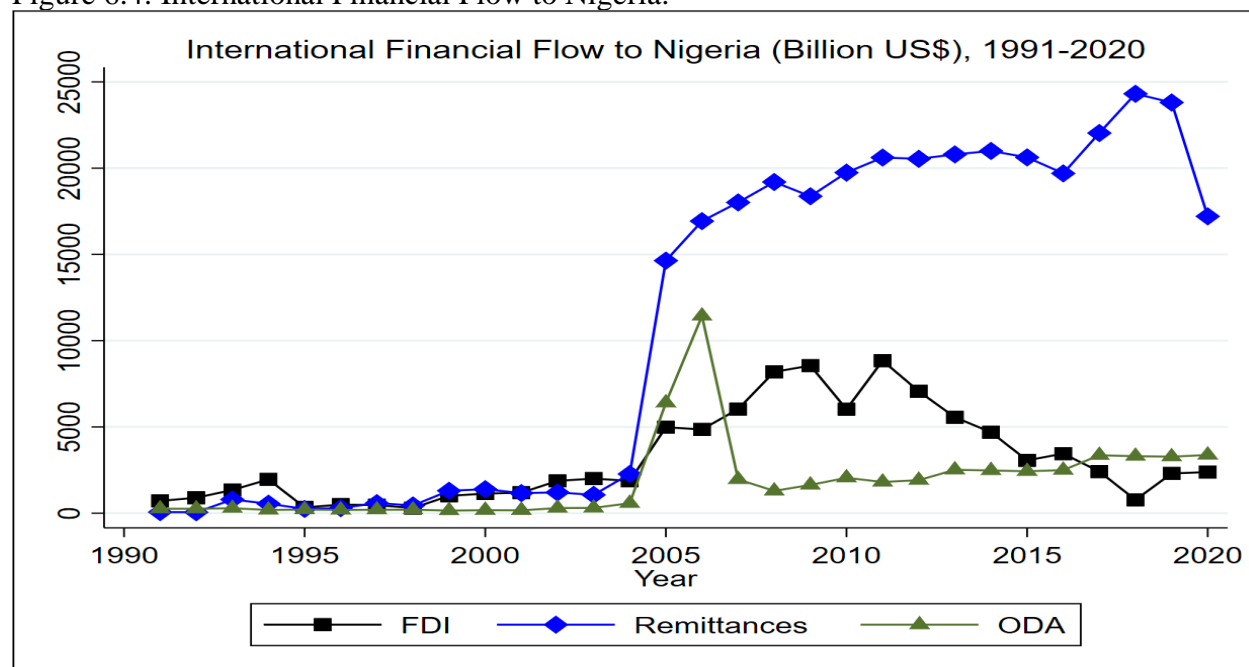
several developing countries, the remittance inflow to Nigeria responded to the pandemic-induced shock by dropping to US\$17 billion in 2020 before increasing to US\$19 billion by 2021. Currently, Nigeria is the 10th largest remittance recipient globally, as presented in Figure 6.5, second in Africa after Egypt, and first in Sub-Saharan Africa.

Table 6.1: Destinations and Number of Nigerian Emigrants

Destination	Total ('000)			Male		Female	
	2000	2010	2020	2020 ('000)	%	2020 ('000)	%
WORLD	610	996	1,670	877	52.5	792	47.5
USA	138	216	402	195	48.6	206	51.4
UK	85	162	205	103	50.4	102	49.6
Cameroon	90	82	169	76	44.9	93	55.1
Niger	18	19	154	74	48.2	80	51.8
Italy	26	53	103	61	59.3	42	40.7
Benin	27	67	87	43	50.3	43	49.7
Ghana	16	57	80	46	57.6	34	42.4
Germany	14	21	52	33	63.5	19	36.5
Canada	10	27	45	23	51.4	22	48.6
Côte d'Ivoire	38	41	45	22	50.0	22	50.0

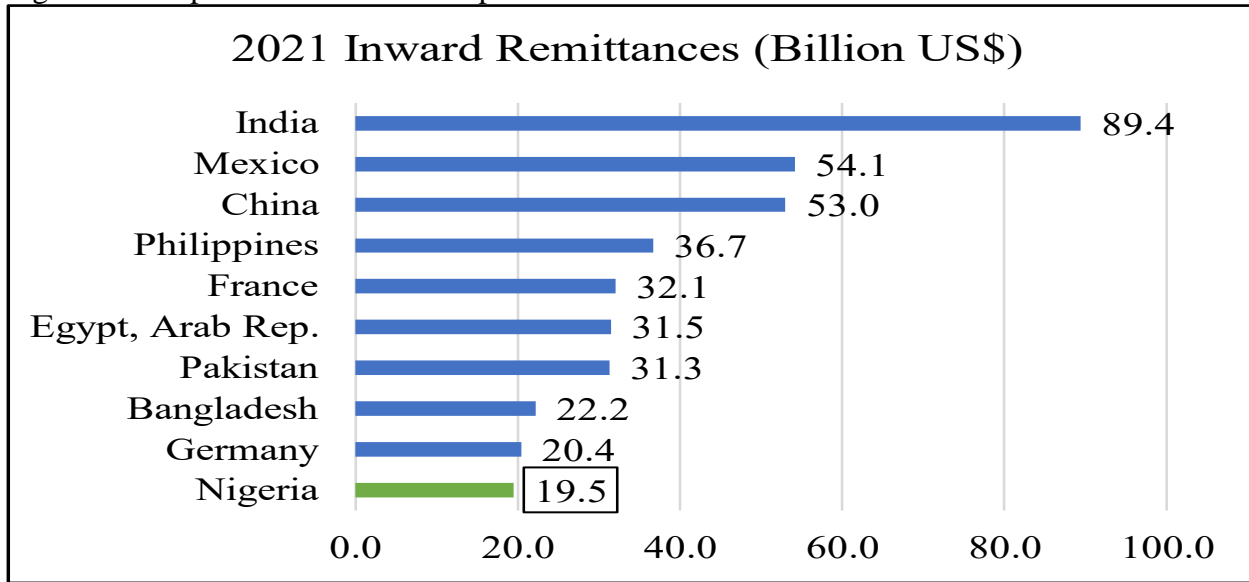
Source: United Nations Department of Economic and Social Affairs (UN-DESA), Population Division (2020)

Figure 6.4: International Financial Flow to Nigeria.



Source: Data from WDI, World Bank (2022); World Bank-KNOMAD (2022)

Figure 6.5: Top 10 Remittances Recipients in 2021



Source: Data from World Bank-KNOMAD (2022)

The sizeable remittance inflow to Nigeria has been followed by many empirical studies to assess their effectiveness on several socioeconomic measures, including poverty (Fowowe & Shuaibu, 2021), household consumption of durables, food, education (Ajefu & Ogebe, 2021), housing investment and savings (Osili, 2004, 2007), and economic growth. A recent study by Ainembabazi and Kemeze (2022) find that remittances are associated with employment creation for individuals in receiving (when remittances are low relative to household income) and non-receiving households (when remittances are high relative to household income) in Nigeria. This finding suggests that remittances may be associated with labor force participation at extensive or intensive margins, which this study seeks to explore.

6.3 Empirical Analyses and Discussions of Findings

This section presents and discusses the empirical findings from the analysis of the effect of remittances on labor supply to three occupations and entrepreneurship in Nigeria. For context, Equations 10 to 12 in Chapter 3, which guide the empirical findings of this chapter, are repeated here as follows:

$$LFP_{W,A,Ni}^* = \beta_0 + \beta_1 Rem_i + \beta_2 X_i + \varepsilon_i \quad (10)$$

$$LS_{W,A,Ni}^* = \beta_0 + \beta_1 Rem_i + \beta_2 X + \varepsilon_i \quad (11)$$

where i denotes individuals between the ages of 15 and 65; $LFP_{W,A,Ni}^*$ and $LS_{W,A,Ni}^*$ are the latent variables for labor force participation (LFP, extensive margin) and labor supply (LS, intensive margin), respectively, to wage employment (W), self-employed agriculture (A), and self-owned non-farm enterprises (N). $LFP = 1$ if $LFP_{W,A,Ni}^* > 0$ and 0 if otherwise for the extensive margin, while $LS =$ hours worked if $LS_{W,A,Ni}^* > 0$ and 0 if $LFP_{W,A,Ni}^* \leq 0$. Rem represents both remittances dummy of 1 if the household received international transfers within 12 months and the actual amount received in Naira per household. X is a vector of individual, household, and community characteristics that affect an individual's LFP or LS decisions, as presented in Table A3.5.

Equations (10) and (11) are estimated for the full sample and subsamples of educational attainment level and household income using the IV-probit and IV-Tobit estimators. The subsample analyses are aimed at investigating whether individuals with different levels of formal education or who live in households within different income brackets respond differently to remittance receipts when making labor supply decisions. As a robustness check for the full sample analysis, we use the 2SLS and Heckman selection models for LFP and LS Equations, respectively.

Next, the productive use of remittances (effect on household entrepreneurship) is assessed based on the following equations:

$$Rev_i^* = \gamma_0 + \gamma_1 Rem_i + \gamma_2 F_i + \gamma_3 (Rem_i * F_i) + \gamma_4 X_i + \mu_i \quad (12)$$

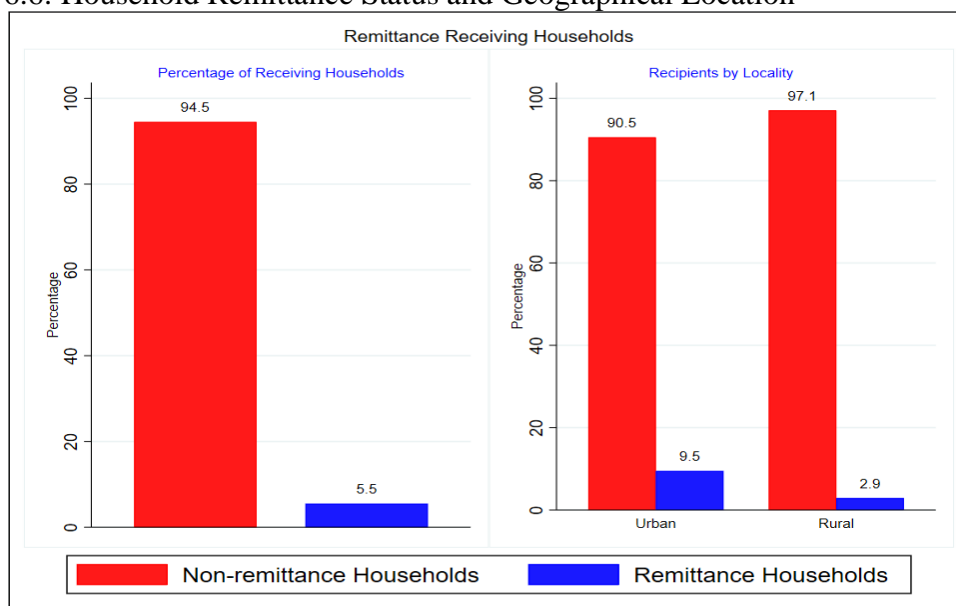
In Equation (12), X now contains firm characteristics alongside individual-, household-, and community-level variables that predict enterprise revenue from Tables A3.5 and A3.6. Rev_i^* is the latent gross revenue generated per enterprise and is only observed (Rev_i) if $L_{Ni}^* > 0$ and *missing* if $L_{Ni}^* = 0$; where L_{Ni}^* is the dummy of owning a non-farm enterprise. In Equation (13), the heterogeneous effect of remittances by enterprise formality status is assessed to show the difference in performance between formal and informal businesses. Lastly, the dataset for this section is generated from the Nigerian Living Standard Measurement Survey of 2018-2019.

6.3.1 Descriptive Statistics

In accordance with the summary statistics in Table A3.5, Figure 6.6 shows that 5.5% of the households in our sample received international remittances within a 12-month period, and most of the receiving households reside in urban areas. Such geographical disparity in receiving remittances suggests an urban bias in Nigeria's international migration. Furthermore, the average

amount of remittances received per household is 165,953.7 Naira (\$510.6²⁰) and slightly above the average household non-remittance income of 157,784.5 Naira (\$485.5) per household.

Figure 6.6: Household Remittance Status and Geographical Location

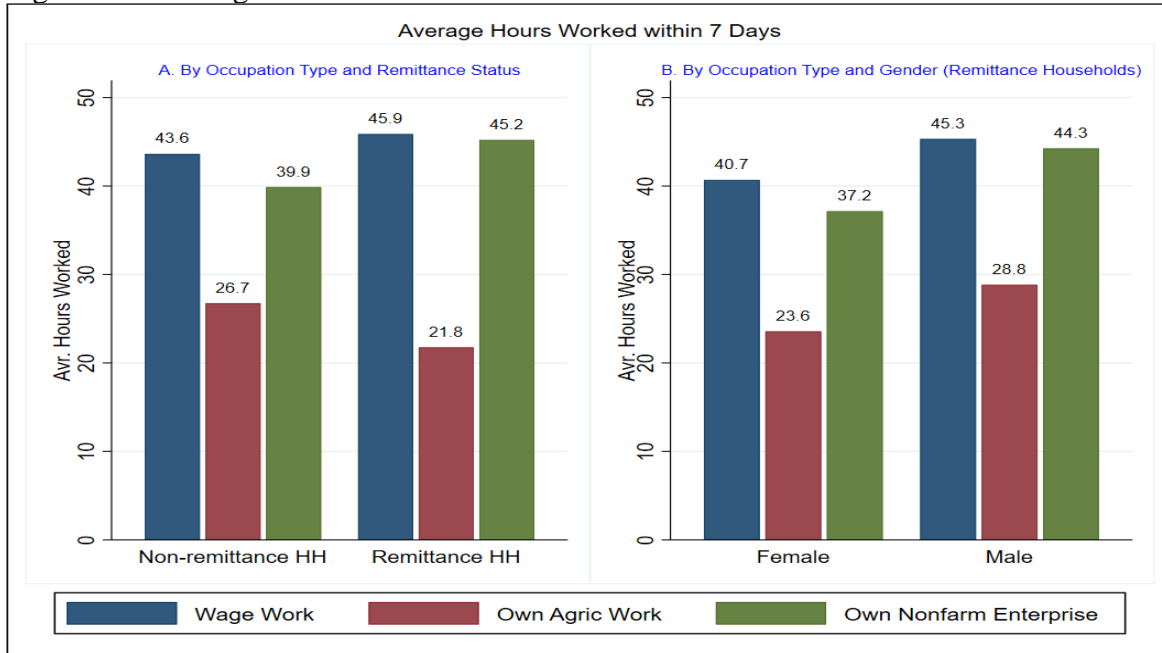


Source: Author's extraction from LSMS 2018/2019

Regarding labor force participation and labor supply, Table A3.5 shows that, at the extensive margin, 12% of the sampled individuals worked in wage employment, 36% in self-employed agriculture, and 30% in non-farm enterprises. At the intensive margin, the average hours worked is 43.8 for wage employment, 26.6 for agriculture, and 40.17 for non-farm enterprises. However, as Figure 6.7 shows, individuals in remittance households tend to work more hours in wage jobs and non-farm enterprises, but fewer hours in agriculture than those in non-remittance households. Within remittance households, men generally worked more hours than women in all three occupational categories. Furthermore, Figures 6.8 and 6.9 show that regardless of the level of educational attainment or household income status, individuals in remittance households generally work fewer hours in agriculture and more hours in non-agricultural jobs (wage work and non-farm enterprises) than those in households without remittances. These differences in hours worked suggest that receiving remittances may have an income effect on agricultural employment such that it encourages less participation in agriculture. On the other hand, recipients may use international remittances to start or expand household enterprises or to decide to work in paid jobs.

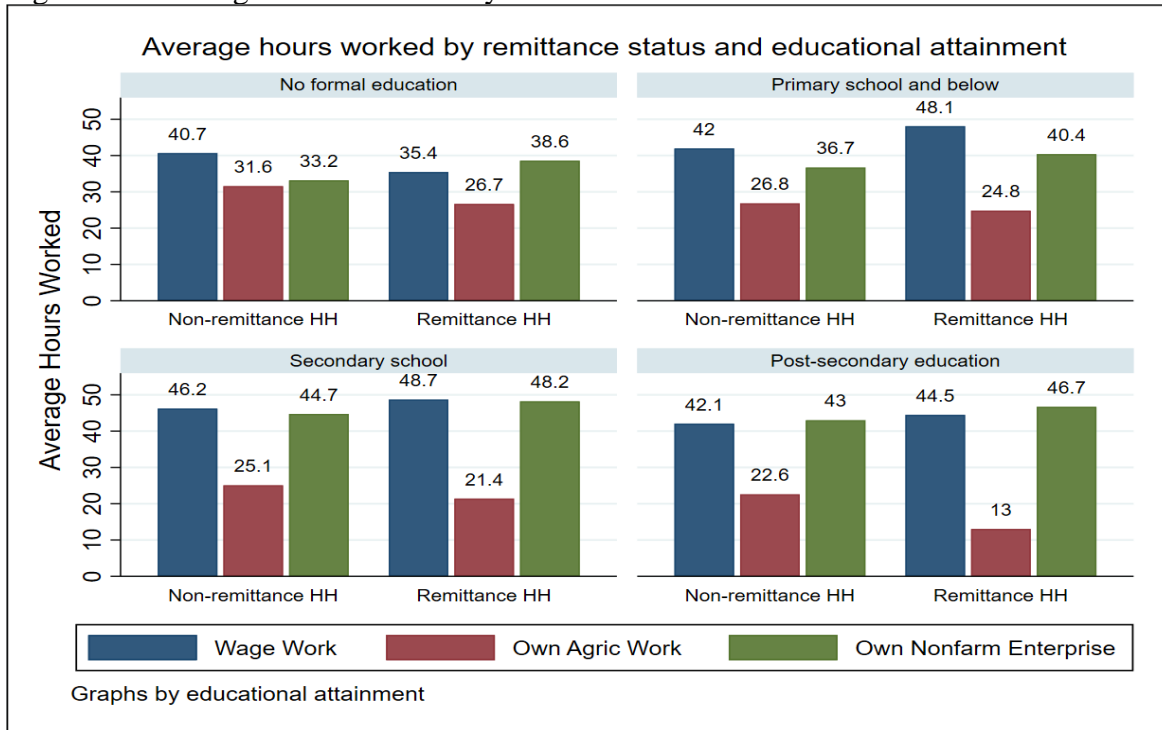
²⁰ Conversion at 2019 exchange rate. Source: [Nigeria: U.S dollar to cedi average exchange rate 2017-2022 | Statista](#)

Figure 6.7: Average Hours Worked – Remittance Status and Gender



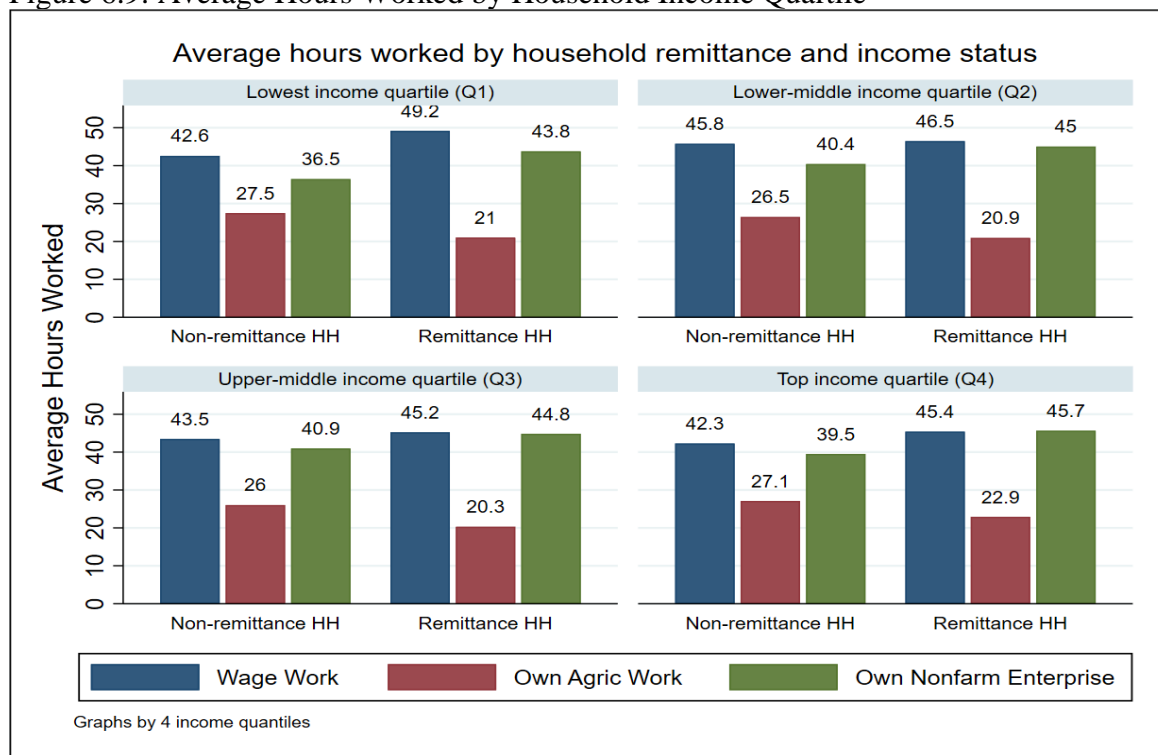
Source: Author's extraction from LSMS 2018/2019

Figure 6.8: Average Hours Worked by Educational Attainment



Source: Author's extraction from LSMS 2018/2019

Figure 6.9: Average Hours Worked by Household Income Quartile



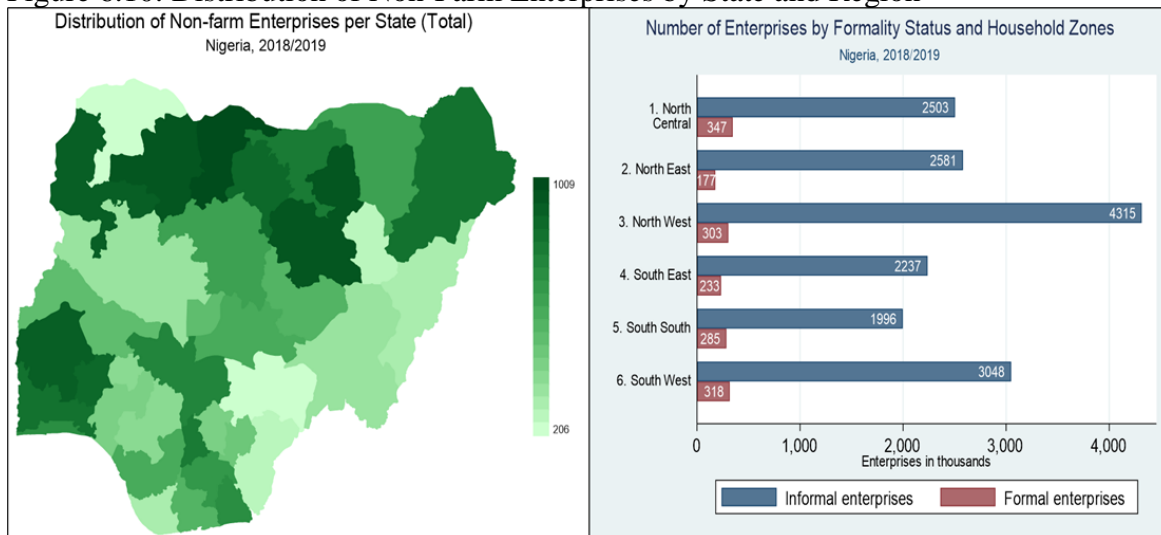
Source: Author's extraction from LSMS 2018/2019

Furthermore, Table A3.5 indicates that females account for 52% of our sample, while the average age is 33 years, indicating a youthfulness of the individuals sampled with an average of 10 years of education. A further breakdown of educational attainment indicates that 14% of our sample had no formal education, while 32% had, at most, primary school education certificates. However, 42%, the highest in our sample, had secondary school education, while 11% had post-secondary education, including bachelor's, master's, and PhD degrees. Eighty-four percent of the households have male heads, while 55% of the household heads can speak and write in English. The average household size in our sample is 5.2 individuals per household, and 63% of the households (a total of 17,347 individuals in our reduced sample) have at least one non-farm enterprise.

Lastly, to analyze the effect of remittances on entrepreneurship, the summary statistics of the relevant enterprise variables in Table A3.6 shows that 91% of the enterprises in our sample are informal, indicating that they are not registered with the government. The literature on the informal economy indicates that although such enterprises create employment (as a safety net) for most people in developing countries, especially in unemployment-ridden economies like Nigeria, such enterprises have a negative effect on the macroeconomic outlook of a country (Ohnsorge & Yu,

2021). In Nigeria, income inequality and unemployment may have contributed to the large informal sector (Haruna & Alhassan, 2022a). Figure 6.10 shows the spread of enterprises by state, region, and formality status. Notably, most household enterprises are concentrated in Northwestern and Southwestern Nigeria. Similarly, both regions have the highest rates of informality in the country.

Figure 6.10: Distribution of Non-Farm Enterprises by State and Region



Source: Author's extraction from LSMS 2018/2019

6.3.2 Remittances, Labor Force Participation and Labor Supply – Full Sample Result

We now turn to the presentation and discussion of the findings on the effect of remittances on labor force participation and labor supply to various occupations in Nigeria. Beginning with the effect of remittances on labor force participation, Table 6.2 presents the results from the second-stage estimations of the IV-Probit and 2SLS of the linear probability models. The first-stage results are presented in columns (1) to (3) of Table A6.2, which show that the two instruments employed (migration network and average remittances received per community with improved communication systems) significantly predict the log of remittances received per household. Our endogeneity tests using the Wald tests of exogeneity (columns (1) to (3) of Table 6.2) reject the null hypothesis that remittances are exogenous, thereby justifying the use of instrumental variable estimation techniques. Furthermore, the test of instrument validity using the Amemiya-Lee-Newey (ALN) test of identifying restrictions following Khan and Valatheeswaran (2016) and Sander and Cohen-Zada (2012) validates our instruments in all cases at the 5% significance level except for

agricultural self-employment in column (2). However, the Sargan-Hansen p-values of the over-identification test show that the instruments are valid for all three outcome equations.

Turning to the covariates in Table 6.2, the dependent variables in columns (1) to (3) of the IV-probit and columns (4) to (6) of the 2SLS are the dummies for labor force participation (extensive margins) to wage jobs (*wage_work*), agricultural work (*agric_work*), and non-farm enterprises (*nfe_work*), respectively. In the IV-probit columns, the results show that an increase in remittances (log) increases the predicted probabilities of labor force participation in wage jobs (column (1)) and non-farm enterprises (column (3)). On the other hand, those in remittance households have a lower predicted probability of working in agriculture than non-remittance household members²¹. These results are confirmed by those of the 2SLS analysis, which show the point estimates of the effect of an increase in remittances on labor force participation. In particular, a 10% increase in remittances increases the probability of participating in wage work and non-farm enterprises by 0.09 each but decreases participation in agriculture by 0.12. The findings point to the likelihood that remittance recipients experience an income effect that pushes them out of agriculture. Next, we evaluate the potential effect of remittances on hours worked.

Table 6.3 shows the second stage and the outcome equation results for the IV-Tobit and Heckman selection techniques (see Table A6.2 for the first-stage results) for labor supply (intensive margins; hours worked). In addition to the test of the exogeneity of remittance and instrument validity, we include a Wald test of independent equations with the null hypothesis of $\rho=0$ to assess the appropriateness of the Heckman model. The results show that the Heckman model is appropriate for our data given the significance of the p-values of the Wald test.

Turning to the coefficients in Table 6.3, the results for remittances (log) are identical to those in Table 6.2. Hence, under the IV-Tobit results in columns (1) to (3), a 10% increase in remittances increases labor supply by 0.24 hours for wage employment (*wage_hr*) and 0.15 hours for non-farm self-employment (*nfe_hr*). However, the same increase in remittances reduces the hours worked in agriculture by 0.2 hours (*agric_hr*). Additionally, the results for the Heckman model (columns (4) to (6)) provide robustness checks and support those of the IV Tobit model. These results indicate a possible occupational shift from agricultural to nonagricultural engagement among remittance recipients in Nigeria. Moreover, our finding of a negative impact

²¹ Table A6.1 in the Appendix shows IV-probit estimation results when remittance is measured as a dummy and the corresponding first-stage regressions. The results are identical to those of Table 6.2

on labor supply to agriculture supports the evidence from two earlier studies in Nigeria (Nwokoye et al., 2020; Urama et al., 2017). On the other hand, our finding of increasing labor supply to non-farm engagements supports those of Khan and Valatheeswaran (2016), Al-Assaf (2022), and Dey (2022), who find that receiving remittances increases labor supply to self-employed ventures among men in Kerala India, urban women and men in Jordan, and rural India, respectively.

We offer some explanations for these effects of remittances in Tables 6.2 and 6.3. First, the positive effect of remittances on wage employment suggests a substitution effect whereby individuals in remittance households temporarily increase labor supply to market jobs to offset the income lost from the migration of a household member (Cox-Edwards & Rodríguez-Oreggia, 2009), especially when remittances are infrequent, volatile, or insufficient to cover household needs (Amuedo-Dorantes & Pozo, 2012). However, we are precluded from evaluating the volatility assumption because we have no information on the frequency of receiving remittances in a year in our dataset. Second, as propounded by the new economics of labor migration theory, remittances remove the credit constraints faced by households in developing countries with poor financial systems, thereby encouraging entrepreneurship and increasing labor supply to household enterprises. Several studies empirically support this theory, including Kakhkharov (2019). Lastly, the decreasing labor supply to agriculture suggests an income effect of remittances associated with the unattractiveness of agricultural practices for poorer households due to rising input prices, insecurity, growing urbanization, and climate change.

Next, the estimations in Table 6.2 and Table 6.3 also control for several individual, household, and community factors that affect labor supply. For the IV-Probit, 2SLS-LPM, and IV-Tobit models, we find that men (*male*) have a higher tendency to work in both agricultural and wage employment, while the Heckman model indicates that men work more hours in all occupations. This result indicates a potential gap in labor force participation between working-age men and women in Nigeria and corroborates the evidence in Figure 6.1 and the descriptive information in Figure 6.7. Next, the coefficients of age indicate a concave effect on labor supply at both the extensive and intensive margins in all models except for agriculture in the IV-probit model in Table 6.2.

Table 6.2: The Effect of Remittances on Labor Force Participation – Full Sample

	Extensive Margin (LFP); Dummy of Participation					
	IVPROBIT			2SLS-LPM		
	(1)	(2)	(3)	(4)	(5)	(6)
	wage_work	agric_work	nfe_work	wage_work	agric_work	nfe_work
Remittance (log)	.042*** (.009)	-.061*** (.014)	.028*** (.009)	0.009*** (0.002)	-0.012*** (0.004)	0.009** (0.003)
Male = 1	.54*** (.022)	.309*** (.023)	-.124*** (.017)	0.075*** (0.003)	0.085*** (0.007)	-0.030*** (0.005)
Age (years)	.124*** (.005)	.022*** (.003)	.154*** (.003)	0.015*** (0.001)	0.006*** (0.001)	0.041*** (0.001)
Agesq	-.001*** (.00)	0*** (.00)	-.002*** (.00)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Years of education	.064*** (.002)	-.008*** (.002)	-.012*** (.002)	0.010*** (0.000)	-0.002*** (0.000)	-0.004*** (0.000)
Married = 1	.027 (.022)	.066*** (.018)	.111*** (.017)	0.017*** (0.003)	0.015** (0.005)	0.033*** (0.006)
Dependency ratio	.12** (.052)	-.171*** (.042)	.403*** (.041)	0.027*** (0.008)	-0.059*** (0.012)	0.101*** (0.013)
owns non-farm enterprise	-.555*** (.023)	-.425*** (.019)	--	-0.095*** (0.004)	-0.126*** (0.006)	--
Household income (log)	.078*** (.004)	.02*** (.003)	.092*** (.004)	0.010*** (0.000)	0.006*** (0.001)	0.019*** (0.001)
Household size	-.017*** (.004)	.01*** (.002)	-.011*** (.002)	-0.002*** (0.000)	0.003*** (0.001)	-0.002** (0.001)
Household head_male	-.232*** (.032)	.005 (.026)	-.154*** (.025)	-0.026*** (0.005)	-0.001 (0.007)	-0.040*** (0.007)
head is literate (English)	.065** (.025)	-.059*** (.02)	.038* (.02)	0.014*** (0.003)	-0.014* (0.006)	0.014* (0.006)
Owns agric land	-.124*** (.024)	.811*** (.023)	-.048** (.02)	-0.029*** (0.005)	0.269*** (0.007)	-0.020** (0.006)
Unemployment rate	-.002 (.001)	-.055*** (.001)	-.016*** (.001)	-0.000 (0.000)	-0.015*** (0.000)	-0.004*** (0.000)
Infrastructure: road	.172*** (.034)	-.052* (.028)	.232*** (.031)	0.017*** (0.004)	-0.022** (0.009)	0.062*** (0.008)
Infrastructure: school	.163*** (.062)	-.158*** (.04)	.259*** (.054)	0.011 (0.006)	-0.045*** (0.012)	0.067*** (0.013)
Urban area	.292*** (.028)	-.558*** (.037)	.291*** (.025)	0.050*** (0.005)	-0.156*** (0.010)	0.085*** (0.008)
Constant	-5.51*** (.124)	.368*** (.076)	-4.768*** (.093)	-0.410*** (0.014)	0.613*** (0.023)	-0.748*** (0.021)
Observations	61082	61082	61082	61082	61082	61082
Exogeneity p-value	0.00	0.00	.003	.000	.008	.001
ALN Chi ² p-value	0.11	0.03	0.74	--	--	--
Sargan-Hansen p-value	--	--	--	0.135	0.153	0.857
KP UnderID p-value	--	--	--	0.000	0.000	0.000
Regional Dummies	YES	YES	YES	YES	YES	YES

Note: Standard errors are in parentheses and clustered at the community (PSU) level; *** $p < .01$, ** $p < .05$, * $p < .1$. ALN is the P-value of the Amemiya-Lee-Newey minimum chi-sq statistic for overidentifying restrictions. It is insignificant at 5% level in all models for IV-Probit except for agriculture. Thus, the instruments are valid for labor force participation in wage jobs and non-farm enterprises. Sargan-Hansen p-value tests the joint null hypothesis of overidentification of all instruments for the 2SLS linear probability model estimations. A failure to reject the null indicates the validity of our instruments. KP is the Kleibergen-Paap under-identification p-values and they indicate that the Equations are identified.

Table 6.3: The Effect of Remittances on Labor Supply – Full Sample

	Intensive Margin (Labor Supply)					
	IVTOBIT			Heckman		
	(1)	(2)	(3)	(4)	(5)	(6)
	wage_hr	agric_hr	nfe_hr	wage_hr	agric_hr	nfe_hr
Remittance (log)	2.507*** (.549)	-1.943*** (.353)	1.464*** (.402)	.457** (.218)	-.859*** (.283)	.743*** (.201)
Male = 1	33.687*** (1.32)	9.959*** (.562)	-1.137 (.776)	5.608*** (.487)	5.419*** (.308)	9.444*** (.4)
Age (years)	7.436*** (.256)	.886*** (.07)	7.124*** (.149)	.128 (.154)	.654*** (.049)	.476*** (.098)
Agesq	-.08*** (.003)	-.009*** (.001)	-.081*** (.002)	-.003 (.002)	-.008*** (.001)	-.006*** (.001)
Years of education	3.633*** (.119)	-.356*** (.039)	-.528*** (.067)	-.23*** (.056)	-.312*** (.026)	0 (.034)
Married = 1	1.248 (1.24)	1.418*** (.387)	5.305*** (.733)	.159 (.512)	.112 (.294)	-.246 (.362)
Dependency ratio	5.483* (2.953)	-2.785*** (.945)	18.472*** (1.765)	-3.185** (1.255)	.503 (.721)	.151 (.934)
ownsnon-farm enterprise	-31.479*** (1.218)	-13.233*** (.469)	- -	-.236 (.471)	-7.352*** (.332)	- -
Household income (log)	4.588*** (.227)	.519*** (.076)	4.33*** (.161)	.705*** (.216)	.198*** (.061)	.761*** (.135)
Household size	-1.051*** (.217)	.252*** (.055)	-.681*** (.108)	-.138* (.072)	.056 (.041)	-.188*** (.049)
Household head_male	-13.858*** (1.891)	-.049 (.632)	-7.194*** (1.114)	-.565 (.769)	-.697 (.51)	-1.794*** (.619)
head is literate (English)	4.375*** (1.523)	-1.665*** (.445)	1.978** (.845)	1.781*** (.688)	-.526 (.322)	.691* (.38)
Owns agric land	-7.588*** (1.396)	15.246*** (.508)	-3.835*** (.881)	-2.385*** (.519)	-.661* (.357)	-4.154*** (.465)
Unemployment rate	-.078 (.074)	-1.144*** (.033)	-.574*** (.052)	.111*** (.027)	.1*** (.03)	.193*** (.025)
Infrastructure: road	10.198*** (1.989)	-2.411*** (.645)	9.962*** (1.352)	.582 (.706)	-2.404*** (.499)	.125 (.496)
Infrastructure: school	10.049*** (3.682)	-2.873*** (.92)	10.603*** (2.407)	1.923 (1.682)	.111 (.76)	-.79 (.88)
Urban area	17.427*** (1.656)	-14.315*** (.947)	14.303*** (1.094)	2.28*** (.571)	-1.078* (.582)	3.84*** (.488)
Constant	- 328.459*** (6.926)	6.377*** (1.769)	-220.978*** (4.4)	30.543*** (5.122)	24.118*** (1.475)	20.562*** (3.084)
Observations	61082	61082	61082	61082	61082	61082
Selected Obs.	6297	25872	16943	6297	25872	16943
Exogeneity p-value	0.00	0.00	0.00	-	-	-
ALN Chi ² p-value	0.08	0.69	0.84	-	-	-
Wald indep eqns. P-val	-	-	-	0.00	0.00	0.00
Regional Dummies	YES	YES	YES	YES	YES	YES

Note: Standard errors are in parentheses and clustered at the community (PSU) level; *** $p < .01$, ** $p < .05$, * $p < .1$. ALN is the P-value of the Amemiya-Lee-Newey minimum chi-sq statistic for overidentifying restrictions. It is insignificant at 5% level in all models for IV-Tobit, indicating that the instruments are valid. Wald indep eqns: Wald Test of Independent Equations – measures the independence of the selection and outcome Equations of the Heckman model. Failure to reject the null that $\rho=0$ indicates that our model may suffer from selection bias and that the use of the Heckman model is appropriate for our data.

Another significant finding is the literacy status of the household head (*head is literate (English)*). The results show that living in a household where the head is literate increases both the likelihood of working and the hours worked in wage employment and non-farm enterprises, but reduces labor supply to agriculture. This portrays the nature of several Nigerian communities, where households with educated parents promote human capital development through education and often pursue paid employment over subsistence agricultural practices. Lastly, Tables 6.2 and 6.3 also show strong evidence that individuals living in communities with road networks (*infrastructure: road*) or schools (*infrastructure: school*) are more likely to increase hours worked in paid jobs and non-farm enterprises, while reducing labor supply to agricultural activities. This finding further corroborates the evidence that urban dwellers generally favor paid employment and enterprises over agriculture and indicates the declining relevance of agricultural activities in communities that experience infrastructural development. Given these findings, the following subsections assess whether the effects of remittances vary by individuals' educational attainment or household income level.

6.3.3 Heterogenous Effect of Remittances for Different Educational Attainment

Based on the preceding findings in Table 6.2 and Table 6.3, this subsection focuses on assessing the effect of remittances on the occupational choices of individuals with different educational attainment. The aim is to determine whether individuals' education level affects their decisions to work and the hours worked if they live in remittance households. The estimations are performed based on subsamples of individuals with no formal education, primary education, secondary education, and post-secondary education. The abridged versions of the results with the coefficients of remittances are reported in Table 6.4 for labor force participation (extensive margin; dummy) and labor supply (intensive margin; hours worked) using the IV probit and IV Tobit techniques, respectively.

Starting with the IV-Probit results for labor force participation, panels A, B, and C of Table 6.4 show that an increase in remittances increases the predicted probabilities of working in paid jobs (*wage_work*; column (1)) and non-farm enterprises (*nfe_work*; column (3)) for individuals without formal education and those who attained primary and secondary level education. This indicates that remittance recipients in Nigeria with secondary-level education and below are more likely to work in non-agricultural jobs than those with the same level of education but without

remittances. Interestingly, the magnitudes of the remittance coefficients in columns (1) and (3) decrease with each additional level of education. This decrease suggests that people with higher education may be less influenced by remittances to participate in the labor force. For instance, the coefficients of remittances in columns (1) and (3) of panel D for people with post-secondary education are not significant at the 5% level. However, the predicted probability of working in agriculture decreases with an increase in remittances. The effects on agriculture (*agric_work*) are lower in both magnitude and level of significance with lower levels of education, suggesting that the less educated are less likely to leave agriculture than the most educated in remittance households.

Next, the signs of the coefficients of remittances in the IV-Tobit estimations in columns (4) to (6) of Table 6.4 mirror those of the IV-probit estimations in columns (1) to (3). In particular, a 10% increase in remittances increases the number of hours worked between 0.08 and 0.9 in wage jobs (*wage_hr*) for all educational categories (column (4); panels A to D) and between 0.2 and 0.4 in non-farm enterprises (*nfe_hr*) for only those without formal education and those with primary and secondary education (column (6)). On the other hand, those with postsecondary education in remittance households tend to work fewer hours in agriculture (*agric_hr*) than other educational categories, as shown in column (5). These results suggest that having higher education and receiving remittances lead to a reduction in the number of hours spent working on the farm.

Hence, more educated Nigerians in remittance households experience an income or moral hazard effect as they are more likely to withdraw from agriculture. As Nwokoye et al. (2020) presume, more educated individuals are likely to have higher reservation wages because of their skills and bargaining power, limiting the kind of jobs they are willing to take. On the other hand, the unattractiveness of the agricultural sector pushes more highly educated individuals in remittance households out of the agricultural sector compared to less educated individuals. Overall, the findings in Table 6.4 point to the importance of remittances in supporting those without formal education and those with the least tendency to migrate. Second, the findings also suggest that the level of education matters when analyzing the effect of remittances on labor force participation and labor supply. The next subsection considers whether remittances matter in labor supply decisions when household income is high.

Table 6.4: Heterogeneous Effect of Remittances by Educational Attainment

	Labor Force Participation (Dummy)			Labor Supply (Hours worked)		
	(1)	(2)	(3)	(4)	(5)	(6)
	wage_work	agric_work	nfe_work	wage_hr	agric_hr	nfe_hr
(A) No formal education						
Remittances (log)	.106** (.05)	-.037 (.04)	.084** (.037)	8.459** (3.824)	-.952 (.898)	3.349** (1.423)
Observations	10286	10286	10286	10286	10286	10286
Uncensored obs.	--	--	--	278	5299	2700
Wald test of exogeneity	3.403	2.271	3.397	4	1.643	4.542
P value of wald test	.065	.132	.065	.046	.2	.033
ALN Chi ² p-value	0.5511	0.0830	0.7946	0.5467	0.3184	0.6294
Regional Dummies	YES	YES	YES	YES	YES	YES
(B) Primary School Education						
Remittances (log)	.071*** (.023)	-.041* (.022)	.087*** (.018)	5.85*** (1.697)	-1.455*** (.511)	3.658*** (.685)
Observations	20269	20269	20269	20269	20269	20269
Uncensored obs.	--	--	--	1066	10184	6623
Wald test of exogeneity	13.805	2.433	12.206	16.956	7.016	19.019
P value of wald test	.000	.119	.000	.000	.008	.000
ALN Chi ² p-value	0.1197	0.1101	0.0888	--	0.9228	0.0607
Regional Dummies	YES	YES	YES	YES	YES	YES
(C) Secondary School Education						
Remittances (log)	.033** (.015)	-.058*** (.017)	.025** (.012)	2.457** (1.036)	-1.825*** (.438)	1.397** (.55)
Observations	6866	6866	3902	6866	6866	6866
Uncensored obs.	--	--	--	2695	1985	1522
Wald test of exogeneity	3.984	5.004	5.148	6.559	8.279	.221
P value of wald test	.046	.025	.023	.01	.004	.638
ALN Chi ² p-value	0.3464	0.9112	0.1572	0.2757	0.4234	0.2489
Regional Dummies	YES	YES	YES	YES	YES	YES
(D) Post-secondary School Education						
Remittances (log)	.021* (.012)	-.066*** (.022)	.001 (.014)	.882** (.407)	-2.021*** (.531)	.44 (.836)
Observations	6866	6866	6866	6866	6866	6866
Uncensored obs.	--	--	--	2695	1985	1522
Wald test of exogeneity	3.984	5.004	.001	6.559	8.279	.221
P value of wald test	.046	.025	.978	.01	.004	.638
ALN Chi ² p-value	0.2460	0.5520	0.5603	0.4261	0.7804	0.5753
Regional Dummies	YES	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1. columns (1) to (3) are from IV-probit while columns (4) to (6) are from IV-Tobit estimators.*

6.3.4 Heterogeneous Effect of Remittances by Income Quartile

We re-estimate the IV-Probit and IV-Tobit models considering the heterogeneous effect of remittances on labor force participation and labor supply for subsamples of household income quartiles and present the abridged results in Table 6.5. Beginning with the IV-Probit results in columns (1) to (3), we find that for households in the second- and fourth-income quartiles (panels

B and D), remittances have significant (at the 5% and 1% levels) positive effects on the predicted probabilities of working in wage jobs (*wage_work*) but insignificant effects for other income groups (panels A and C). With respect to nonfarm enterprises (*nfe_work*), only individuals in households within the third- and fourth-income quartiles that receive remittances are likely to work in such occupations. However, individuals in all income groups that receive remittances are more likely than those without remittances to quit agricultural engagement (*agric_work*).

Similarly, the results from the IV-Tobit estimations in columns (4) to (6) follow those of IV-Probit. For instance, a 10% increase in remittances decreases the hours worked in agriculture (*agric_hr*; column (5)) between 0.1 and 0.3 in all panels of Table 5, suggesting that an increase in non-labor income, such as remittances, allows individuals to withdraw from agricultural practices. We suspect that this could be due to the lack of profitability in agriculture caused by various issues including climate change, insecurity, and the cost of farm inputs. For wage jobs (*wage_hr*) in column (4), increasing remittances by 10% only affects the hours worked by individuals in the second (panel B) and fourth (panel D) income quartiles positively at the 1% level of significance.

Next, column (6) of Table 6.5 shows that for households in the third (panel C) and fourth (panel D) income quartiles, remittances lead to an increase in hours worked in non-farm enterprises (*nfe_hr*), especially for the top-income households. This finding is interesting and consistent with Kakhkharov (2019), who argues that remittances are only enterprise-inducing in households with sufficient non-remittance income. However, rather than starting new enterprises, such high-income households are likely to use remittances to expand their existing ventures (Amuedo-Dorantes & Pozo, 2006b). Furthermore, the negative but insignificant effect for lower-middle-income and low-income households suggests that when remittances are high relative to household non-remittance income, individuals are more likely to withdraw from non-farm enterprises. Instead, Ainembabazi and Kemeze (2022) show that such enterprises are likely to employ non-household members as employees.

Overall, these findings indicate the potential significance of household labor income against remittances in influencing Nigerians' labor supply and labor force participation. We observe that, in many cases, remittances seem to have an insignificant effect, especially for lower-income households with respect to non-farm engagements. However, for the top-income households, where we find significant effects of remittances for all three occupations, we are careful not to ascribe the increase in labor supply to paid jobs and non-farm enterprises strictly to

the effects of remittances. Instead, our results suggest a neutral effect of remittances (Cox-Edwards & Rodríguez-Oreggia, 2009).

Table 6.5: Heterogeneous Effect of Remittances by Household Income Level

	Labor Force Participation (Dummy)			Labor Supply (hours worked)		
	(1)	(2)	(3)	(4)	(5)	(6)
	wage_wor	agric_work	nfe_work	wage_hr	agric_hr	nfe_hr
(A) First Income Quartile (Lowest Income): Average Income = 10322.22 Naira						
Remittances (log)	.02	-.071**	-.023	1.803	-2.576***	-1.282
	(.026)	(.029)	(.024)	(1.656)	(.685)	(1.274)
Observations	11402	11402	11402	11402	11402	11402
Uncensored obs.	--	--	--	1032	5015	1655
Wald test of exogeneity	2.787	2.313	.074	3.527	7.729	.15
P value of wald test	.095	.128	.786	.06	.005	.699
ALN Chi ² p-value	0.1590	0.6883	0.3916	0.1536	0.2471	0.3610
Regional Dummies	YES	YES	YES	YES	YES	YES
(B) Second Income Quartile (Lower-Middle Income): Average Income = 44959.16 Naira						
Remittances (log)	.052**	-.093***	-.011	3.357***	-2.835***	-.151
	(.021)	(.03)	(.018)	(1.29)	(.813)	(.825)
Observations	14280	14280	14280	14280	14280	14280
Uncensored obs.	--	--	--	1645	5724	3864
Wald test of exogeneity	8.061	10.078	.233	9.768	12.899	.032
P value of wald test	.005	.002	.63	.002	.000	.859
ALN Chi ² p-value	0.8334	0.0549	0.8263	0.7772	0.5859	0.9363
Regional Dummies	YES	YES	YES	YES	YES	YES
(C) Third Income Quartile (Upper-Middle Income): Average Income = 101641.84 Naira						
Remittances (log)	.025	-.038*	.024*	1.232	-1.28**	1.141*
	(.018)	(.021)	(.014)	(1.015)	(.501)	(.617)
Observations	16270	16270	16270	16270	16270	16270
Uncensored obs.	--	--	--	1877	6747	5107
Wald test of exogeneity	1.307	2.226	3.68	1.103	3.644	5.021
P value of wald test	.253	.136	.055	.294	.056	.025
ALN Chi ² p-value	0.4911	0.3240	0.8614	0.4105	0.8936	0.9774
Regional Dummies	YES	YES	YES	YES	YES	YES
(D) Fourth Income Quartile (Highest Income): Average Income = 456290.5 Naira						
Remittances (log)	.068***	-.066***	.043***	3.958***	-1.79***	1.952***
	(.013)	(.017)	(.012)	(.727)	(.383)	(.519)
Observations	19130	19130	19130	19130	19130	19130
Uncensored obs.	--	--	--	1743	8386	6317
Wald test of exogeneity	16.332	9.639	8.255	17.86	16.419	10.607
P value of wald test	.000	.002	.004	.000	.000	.001
ALN Chi ² p-value	0.1565	0.1822	0.4471	0.1360	0.5357	0.0690
Regional Dummies	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$. columns (1) to (3) are from IV-probit while columns (4) to (6) are from IV-Tobit estimators.

6.3.5 Heterogeneous Effect Analyses by Northern and Southern Regions

The preceding heterogeneity analyses by educational attainment and household income were based on a national sample. In this section, we investigate whether the heterogeneous effect of remittances on labor supply is consistent between the Northern and Southern parts of Nigeria, given their considerable differences in terms of culture, language, and development outcomes, using the IV Tobit method. The results are reported in Table 6.6 for educational attainment and Table 6.7 for household income. Our findings show striking differences in the effects of remittances on labor supply between the two regions. For instance, we find that uneducated northerners do not significantly reduce the hours worked in agriculture (column (5) of Table 6.6), whereas non-educated southerners (column (2)) reduce hours worked. However, for other educational categories, northerners work approximately twice as few hours on the farm, suggesting that the income effect of remittances on agricultural work is stronger in the north among the educated than in the south.

In columns (1) and (4), those with primary- and secondary-level education in remittance households in both the south and the north increase the hours worked in paid jobs, while those with post-secondary education do not. For individuals without a formal education, only those in the north significantly increased the number of hours worked in paid jobs. Lastly, with respect to non-farm enterprises, we do not find significant effects across all educational categories for the southern subsample, while northerners with pre-tertiary education increased their hours worked in such enterprises.

In Table 6.7 for household income level, we find no significant effect of remittances on hours worked in wage jobs (column (1)) for southerners within all income levels, except for the top income quartile. In contrast, northerners generally worked more hours in paid jobs (column (4)) across all income levels, except for the third level. For agricultural work (columns (2) and (5)), both Northerners and Southerners work fewer hours, with an increase in remittance receipts. A final interesting finding is that in the south, only individuals in the top income group increase their labor supply to non-farm enterprises (column (3)), whereas others are likely to reduce their hours worked. In the north (column (6)), receiving remittances is associated with increased hours worked in non-farm enterprises for all income groups except at the bottom. This finding suggests that average household non-remittance income is higher than remittances across income quantiles, thereby allowing households to engage in entrepreneurship.

Despite the differences in the effect of remittances between Northern and Southern Nigeria, we cannot entirely attribute the effect to purely cultural differences since interregional migration is unrestricted in Nigeria. This means that some remittance households in the North may have Southern origins with different cultural outlooks, education, and income than those with purely Northern origins. These results call for further research on the heterogeneous patterns of domestic and international migration and remittance behavior across geopolitical zones in Nigeria.

Table 6.6: Heterogeneous Effect of Remittances by Location and Educational Attainment

	Southern Nigeria			Northern Nigeria		
	(1) wage_hr	(2) agric_hr	(3) nfe_hr	(4) wage_hr	(5) agric_hr	(6) nfe_hr
(A) No formal education						
Remittances (log)	1.518 (5.084)	-2.486** (1.042)	.917 (1.966)	20.665*** (6.06)	-.117 (1.393)	4.673** (2.071)
Observations	1552	1552	1552	8734	8734	8734
Uncensored obs.	91	983	498	187	4316	2202
Wald test of exogeneity	1.053	8.004	.059	9.874	.062	4.562
P value of wald test	.305	.005	.808	.002	.803	.033
ALN Chi ² p-value	0.7340	0.2592	0.2226	0.4812	0.5732	0.2300
Regional Dummies	YES	YES	YES	YES	YES	YES
(B) Primary Education						
Remittances (log)	4.836** (1.89)	-1.341** (.612)	.747 (.87)	10.382** (4.353)	-2.677*** (1.004)	5.332*** (1.313)
Observations	6250	6250	6250	14019	14019	14019
Uncensored obs.	549	3113	2125	517	7071	4498
Wald test of exogeneity	10.379	3.212	.062	7.42	7.453	12.521
P value of wald test	.001	.073	.804	.006	.006	.000
ALN Chi ² p-value	0.4684	0.5650	0.2792	0.3767	0.8182	0.0013
Regional Dummies	YES	YES	YES	YES	YES	YES
(C) Secondary Education						
Remittances (log)	2.06* (1.053)	-1.613*** (.46)	1.141* (.594)	7.64* (4.226)	-4.503*** (1.478)	3.504** (1.718)
Observations	12677	12677	12677	10984	10984	10984
Uncensored obs.	1439	3832	3657	819	4572	2441
Wald test of exogeneity	4.25	10.447	4.802	3.749	7.752	3.64
P value of wald test	.039	.001	.028	.053	.005	.056
ALN Chi ² p-value	0.8372	0.8622	0.5330	0.2446	0.2711	0.3039
Regional Dummies	YES	YES	YES	YES	YES	YES
(D) Post-secondary Education						
Remittances (log)	.707 (.446)	-1.859*** (.526)	.471 (.956)	.758 (.973)	-3.394** (1.373)	.52 (1.744)
Observations	3312	3312	3312	3554	3554	3554
Uncensored obs.	1276	753	783	1419	1232	739
Wald test of exogeneity	4.977	5.66	.474	.448	5.43	.045
P value of wald test	.026	.017	.491	.503	.02	.832
ALN Chi ² p-value	0.5139	0.4730	0.3249	0.3432	0.1515	0.6440
Regional Dummies	YES	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

Table 6.7: Heterogeneous Effect of Remittances by Location and Household Income Level

	Southern Nigeria			Northern Nigeria		
	(1) wage_work	(2) agric_work	(3) nfe_work	(4) wage_hr	(5) agric_hr	(6) nfe_hr
(A) First Income Quartile (Lowest Income)						
Remittances (log)	1.545 (1.585)	-1.758*** (.634)	-1.834 (1.496)	16.428** (8.04)	-9.237** (3.886)	-.038 (4.46)
Observations	4675	4675	4675	6727	6727	6727
Uncensored obs.	653	1857	770	379	3158	885
Wald test of exogeneity	2.319	2.318	.14	6.76	7.527	.017
P value of wald test	.128	.128	.708	.009	.006	.897
ALN Chi ² p-value	0.3487	0.2899	0.8744	0.6895	0.2249	0.1195
Regional Dummies	YES	YES	YES	YES	YES	YES
(B) Second Income Quartile (Lower-Middle Income)						
Remittances (log)	1.468 (1.3)	-1.957** (.824)	-1.707* (.98)	10.2*** (3.301)	-6.011*** (1.883)	4.522** (2.046)
Observations	5631	5631	5631	8649	8649	8649
Uncensored obs.	878	1947	1771	767	3777	2093
Wald test of exogeneity	3.172	5.699	1.547	11.006	13.208	4.417
P value of wald test	.075	.017	.214	.001	.000	.036
ALN Chi ² p-value	0.2295	0.2221	0.7472	0.5275	0.6572	0.9709
Regional Dummies	YES	YES	YES	YES	YES	YES
(C) Third Income Quartile (Upper-Middle Income)						
Remittances (log)	1.436 (1.101)	-.948 (.582)	-.021 (.77)	.086 (2.538)	-1.902* (1.104)	4.551*** (1.686)
Observations	6510	6510	6510	9760	9760	9760
Uncensored obs.	1005	2234	2188	872	4513	2919
Wald test of exogeneity	1.55	1.73	.361	.006	1.682	5.54
P value of wald test	.213	.188	.548	.937	.195	.019
ALN Chi ² p-value	0.4701	0.6207	0.0046	0.7433	0.7256	0.0043
Regional Dummies	YES	YES	YES	YES	YES	YES
(D) Fourth Income Quartile (Highest Income)						
Remittances (log)	3.62*** (.814)	-1.711*** (.458)	1.308** (.664)	7.039*** (2.118)	-1.675** (.818)	2.929*** (1.093)
Observations	6975	6975	6975	12155	12155	12155
Uncensored obs.	819	2643	2334	924	5743	3983
Wald test of exogeneity	13.762	11.096	2.137	7.157	2.958	6.41
P value of wald test	.000	.001	.144	.007	.085	.011
ALN Chi ² p-value	0.6055	0.3214	0.2755	0.0818	0.6639	0.0771
Regional Dummies	YES	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1*

6.3.6 Remittances and Household Entrepreneurship

Given the evidence that individuals in remittance households are more likely to increase their labor supply to non-farm enterprises, we investigate the effect of remittances on the performance of such enterprises using the Heckman selection model. The outcome variable is the log of the total revenue generated per enterprise. As shown in Table 6.8, receiving remittances increases the

performance of household enterprises. For instance, a 10% increase in remittances increases revenue by 5.7% for remittance households. However, this finding contradicts evidence from Nepal, where remittances generate a moral hazard effect, thereby discouraging the productive use of remittances in entrepreneurship (Kharel et al., 2022). The increase in enterprise revenue indicates a possible enterprise expansion stemming from using remittances to increase inventory or investments in capital goods and to increase the hours worked on such ventures. Next, we examine the effect of the formality of enterprises on their performance. We find that formal enterprises registered with the government have an average of 46.9 percentage points (column (1)) more revenue than enterprises in the informal sectors. Furthermore, larger enterprises (by employee size) generally performed better in terms of revenue generation.

A crucial finding in Table 6.8 pertains to the interaction term between remittances and formality of household enterprises in column (3). The interaction term is negative and significant at the 5% significance level, indicating that formal enterprises in remittance households perform lower than their informal counterparts do. This finding is reflected in Figure 6.11, which clearly shows the predictive marginal effect of remittances on revenue by enterprise formality status. The high performance of informal enterprises highlights the extent of informality among Nigerian micro-, small- and medium-scale enterprises. While such enterprises provide jobs for their owners, household members, and some members of the community, they are often marred by low growth prospects, limit government revenue generation, and are associated with other economic and environmental costs.

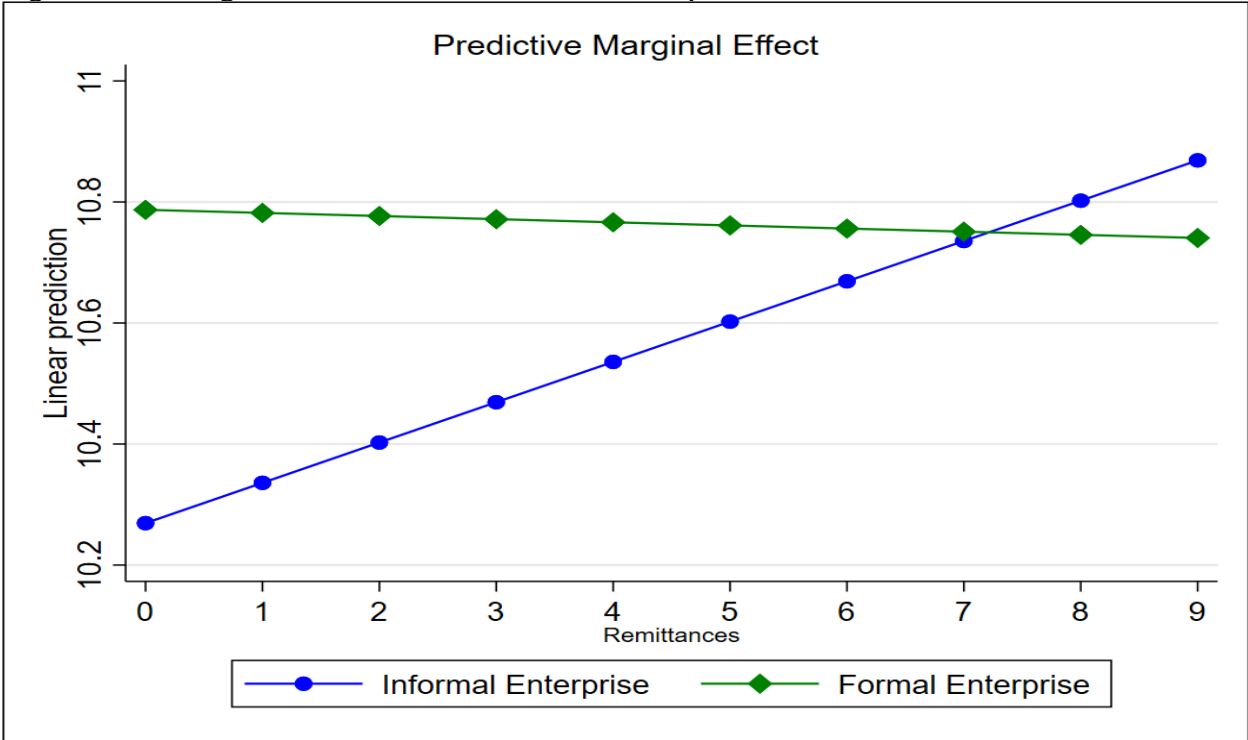
Overall, the findings in this chapter suggest that the effect of remittances on labor supply in Nigeria is sector-specific and differs for individuals depending on their socioeconomic status and educational attainment. Moreover, the findings also indicate the potential of migrants' remittances to foster structural changes in local communities, such as switching from an agrarian-based economy to small-scale manufacturing and services. Finally, the findings also suggest that remittances may lead to the proliferation of informality in Nigeria.

Table 6.8: Remittances, Labor Supply, Entrepreneurship - Heckman Model

	Without Interaction		With Interaction	
	(1) Outcome eqn.	(2) Selection eqn.	(3) Outcome eqn.	(4) Selection eq.
Remittances	.057*** (.013)	.005 (.005)	.067*** (.013)	.005 (.005)
Formal enterprise	.469*** (.038)		.518*** (.041)	
Rem*Formal enterprise			-.072** (.033)	
No. of employees	.071*** (.017)		.071*** (.017)	
Successfully borrowed	.298*** (.028)		.298*** (.028)	
Male = 1	.736*** (.028)	-.149*** (.019)	.735*** (.028)	-.149*** (.019)
Age (year)	.04*** (.009)	.193*** (.003)	.04*** (.009)	.193*** (.003)
Age squared	.000*** (.000)	-.002*** (.000)	.000*** (.000)	-.002*** (.000)
Education (years)	.025*** (.002)		.025*** (.002)	
Primary education and below		.121*** (.021)		.121*** (.021)
Secondary education		.081*** (.024)		.081*** (.024)
Post-secondary education		-.407*** (.031)		-.407*** (.031)
married	-.002 (.026)	.174*** (.018)	-.001 (.026)	.174*** (.018)
Dependency ratio	-.19*** (.061)	.436*** (.04)	-.191*** (.061)	.436*** (.04)
Household size	.026*** (.003)	-.002 (.002)	.026*** (.003)	-.002 (.002)
Household head is male	-.052 (.038)	-.091*** (.025)	-.052 (.038)	-.091*** (.025)
Household head is literate	.107*** (.027)	.04** (.017)	.107*** (.027)	.04** (.017)
Owns agric land	.081*** (.028)	.031 (.02)	.08*** (.028)	.031 (.02)
Share of 15+ in NFE		.061*** (.001)		.061*** (.001)
Share of 15+ unemployed	.002 (.002)	-.003*** (.001)		-.003*** (.001)
Infrastructure: road	-.01 (.038)	.03** (.014)		.03** (.014)
Infrastructure: school	.195*** (.075)	.059** (.023)		.059** (.023)
Urban area	.082** (.032)	.028** (.013)		.028** (.013)
Constant	8.382*** (.299)	-5.427*** (.074)	8.375*** (.298)	-5.427*** (.074)
Observations	60037		60037	
Selected observations	15898		15898	
Wald test of indp eqn (pvalue)	2.55(0.11)		2.484(0.12)	
Industry Dummies	YES	NO	YES	NO
Regional Dummies	YES		YES	

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$

Figure 6.11: Marginal Effect of Remittances on Enterprise Revenue



Chapter 7: Concluding Remarks

7.1 Summary of Findings

The socioeconomic challenges confronting developing countries are often linked to poverty and income inequality as either causes or consequences. However, there is a scholarly consensus that entrepreneurship development is central to providing decent and inclusive jobs, alleviating poverty and reducing the income gap. Such a scholarly submission is premised on the evidence that entrepreneurship development was central to the development trajectories of today's advanced countries. For developing countries, achieving meaningful progress in mass-productive and innovative businesses that could provide jobs and improve general welfare is often marred by inadequate financing and a poor business environment. Following the literature, this study recognizes the potential effect of migrants' remittances in overcoming the financing gap that developing countries may face, but also argues that achieving remittance-based formal entrepreneurship development, poverty alleviation, and income inequality reduction is contingent on key elements in migrant-sending countries, such as digital government infrastructure (e-government) and financial development. Thus, the goals of this study are to (1) assess the effectiveness of e-government and financial development as conditions for achieving remittance-based entrepreneurship development; (2) investigate the need for migrant-sending countries to steer remittance-led reductions in poverty and income inequality through e-government and financial inclusion; and (3) investigate the effect of remittances on entrepreneurship development through the labor supply decisions of recipients in a developing country.

The findings of this study consistently suggest that remittances from migrants could provide developing countries with an effective means of financing entrepreneurship development, eradicating poverty, and reducing income inequality. However, there are some caveats to consider. The empirical evidence in Chapter 4 from cross-country regressions suggests that remittances are, at best, not solely effective in entrepreneurship development unless conditioned on e-government and financial development. Specifically, we find that remittances could enhance formal entrepreneurship in countries with better e-government, where governments use digital infrastructure to augment diaspora engagement initiatives and aid in reducing migrants' transaction costs associated with searching for and investing in viable enterprises in their home countries. This finding supports our theoretical assertion in Chapter 2 that, under a developed e-government

framework, governments can strengthen their connections to their diaspora population by providing them with information on viable business opportunities, secure connections to domestic entrepreneurs, and ease enterprise formalization procedures. Thus, according to our theoretical proposition, which is based on Transaction Cost Economics theory, the development of e-government is expected to foster trust in governments and active involvement of migrants in the development of their home countries.

Second, we conjectured that remittances and domestic financial institutions are complements in promoting remittance-based formal entrepreneurship development. This conjecture contradicts the new economics of labor migration theory, which postulates that remittances substitute for poor financial systems in developing countries. The empirical findings in Section 4.3 of Chapter 4 support our hypothesis and suggest that developing countries with better financial institutions are best positioned to use remittances for entrepreneurship. This finding reinforces the typical role of intermediation that financial institutions such as banks play in designing products and services that encourage savings and efficient capital allocation within the economy. Thus, domestic financial institutions are crucial for mobilizing savings from migrants and allocating them to local entrepreneurs, thereby promoting formal entrepreneurship in migrant-sending countries. In contrast, we find no complementary role of financial markets, such as the bond and stock markets, in fostering remittance-based enterprises. Instead, when financial markets are developed, remittances become less useful for early-stage entrepreneurship.

Chapter 5 answers an important question on whether remittances reduce poverty and income inequality in developing countries, and whether conditional factors such as e-government and financial inclusion play moderating roles. We argue that for a sustained and rapid reduction in poverty and income inequality, governments of migrant-sending countries must act to steer the inflow and usage of remittances. Our empirical findings imply that without government intervention through augmented diaspora engagement with ICT and financial inclusion domestically, remittances may increase household income and decrease overall poverty but lead to increased income inequality within a country. When conditioned on the level of e-government and financial inclusion, poverty and income inequality can be reduced in developing countries that rely on remittances. This finding implies that remittances are crucial to addressing several SDG targets, including “*no poverty, zero hunger, decent work and economic growth, and reduced inequalities.*” The importance of this finding is further entrenched, as several SDGs are far from

being achieved due to poor financing in developing countries. However, as the International Fund for Agricultural Development (2022) points out, remittances may be a potential financing source for meeting national, community, and household goals. Thus, our findings reinforce this idea by introducing some of the crucial efforts that must be taken in developing countries to achieve the SDG targets through remittances.

Finally, Chapter 6 revisits the remittance-entrepreneurship link using a case study of Nigeria, given the country's position as the 10th highest remittance recipient in the world in 2021 and the first in sub-Saharan Africa, with an increasing diaspora population and a crude labor market. The chapter answered the question of whether remittances can affect entrepreneurship through the labor force participation of Nigerians in remittance households. Our findings imply a possible occupational switch from agricultural to nonagricultural engagements. Specifically, contrary to the neoclassical assumption that nonlabor income such as remittances raises the reservation wage of rational individuals and eventually leads to reduced labor supply, we find that some Nigerians increase labor supply, especially to paid jobs and non-farm enterprises, despite the receipt of remittances. The increased labor supply is common among the less educated and those from high-income households. Furthermore, increasing labor supply to non-farm enterprises is crucial for entrepreneurship development, especially in the informal sector. The increased hours worked in household non-farm enterprises when receiving remittances generally increases enterprise revenue and points to potential job creation within communities with migrant families.

7.2 Contributions of the Study

The preceding findings of the study contribute to different strands of literature. First, it contributes to the literature on the developmental impact of remittances in developing countries by focusing on the mechanisms for achieving meaningful progress in formal entrepreneurship development. Much of the research on the remittance-entrepreneurship connection has been at the household or individual level, where most enterprises are informal and suffer from the common challenges of stunted growth and inadequate access to formal credit. Thus, this study focuses on promoting innovative and employment-generating enterprises using alternative financing aided by government initiatives and financial sector support.

Second, introducing digital governance as part of an information-sharing node adds a new perspective to the literature on transaction cost economics (TCE). Prior to this study, TCE was

chiefly associated with firms or among agents outside the government, especially in business management and international business. However, our application can be considered a new interpretation of the theory and an augmentation of the studies by Vaaler (2013), Martinez et al. (2015), and Yavuz and Bahadir (2021), where TCE is considered under a migrant-kin and migrant-migrant relationship without the government's role.

Third, this study contributes to resolving the debate on the role of remittances in fostering sustained welfare improvements among recipients. Given the increasing need for models to reduce income inequality and poverty in developing countries, our contribution stems from identifying the functions that the government could play using ICT and financial inclusion strategies. Many existing studies have been divided on whether remittances increase or decrease income inequality and, to some extent, the general poverty level. We argue and show that these varying views result from underplaying the role of governments between remittances and the development of migrant-sending countries.

Lastly, we have stirred up the literature on the effect of non-labor income on labor supply in developing countries. While presenting evidence of an occupational shift and the limits of neoclassical theories of labor supply in Nigeria, this study contributes to this line of research by showing that labor supply decisions in remittance households vary for individuals of different educational exposure and by existing household income. Such heterogeneity in the effect of remittances on labor supply was previously missing in the literature, especially in the case of Nigeria. Furthermore, this study provides the first empirical evidence of the effect of international remittances on household enterprise performance in both Nigeria's formal and informal sectors.

7.3 Implications and Recommendations

The findings of this study hold important cues for policy design and implementation in developing countries. First, building trust is paramount for policymakers to effectively court migrants' investment in their home countries. Tittel-Mosser (2021b, 2021c, 2021a) notes that one of the major barriers to the diaspora's willingness to invest in the home countries is their animosity toward the government. Our findings show that e-government development offers governments opportunities to be more transparent and accountable, and to garner trust from the diaspora. In this way, more remittances can be generated from migrants to address development challenges such as unemployment, poverty and income inequality in developing countries. Accordingly, this study

recommends that migrant-sending countries establish digital economic zones where migrants can be more confident to invest in formal enterprises as angel investors to defray the inadequacy of venture capitalists. Within this framework, the role of governments should be limited to bridging information asymmetry, reducing transaction costs and opportunism, and guaranteeing the safety of migrants' investments. A successful and effective application of e-government would also encourage intending migrant entrepreneurs to pursue opportunity-driven ventures and contribute meaningfully to national development, poverty alleviation and income inequality reduction through entrepreneurship development.

Second, although financial inclusion and development have been widely promoted in the literature, this study further justifies the need to intensify inclusion measures in developing countries. We have demonstrated with compelling empirical evidence that the financial sectors in developing countries have active roles to play in marshalling the inflow and use of remittances for development. These roles include the intermediation between surplus remittance savers and nonremittance recipients, the mobilization of savings from migrants, and the deepening of financial inclusion. Thus, we recommend that for achieving efficient use of remittances, the financial sectors in developing countries should develop migrant-targeted products and services that encourage savings in the home countries and efficient credit allocation for productive use. Such products and services may include innovative financial technologies, including digital currency-based systems to ease the transfer and receipt of remittances; offering incentives such as a fixed percentage of saved remittances as a reward to mobilize savings and address the moral hazard effect of remittances; and complementing e-government strategies for matching migrants with domestic entrepreneurs and financing development projects in strategic locations such as the home communities of a particular migrants' association or group.

Lastly, the evidence of an occupational shift from farm to non-farm engagements among remittance recipients in Nigeria suggests that remittances can be leveraged to promote small-scale manufacturing and service-based enterprises in developing countries, making remittances sources of financial structural change. Thus, this study recommends that governments create avenues for remittance recipients to engage in entrepreneurship. These avenues may include acknowledging the creditworthiness of the recipients to afford them access to formal banking credit for investments and enterprise expansion. The Nigerian government should also offer enterprise formalization training to remittance recipients with non-farm enterprises to facilitate their

transition from the informal to the formal sector. Additionally, our findings show that remittances are quite important to the less educated. Thus, we recommend that the Nigeria government should engage in assisted migration programs for less educated as migrant workers for upskilling and income generation. Such aided migration will benefit the country in numerous ways, including increasing remittance inflows, economic engagements and addressing youth unemployment.

7.4 Limitations and Directions for Future Research

This study acknowledges a few limitations that serve as the basis for further research. First, the role of e-government studied uses an oversimplified or generalized index from the United Nations e-government development index for the countries for which data were available. However, not all countries have taken significant steps in using e-government as part of their diaspora engagement strategies. Thus, the generalization of our findings may be an overstretch. This inevitably requires a more rigorous case study investigation of the effectiveness of digital diaspora engagements in countries that implement such policies to establish any causal effects.

Second, there is increasing competition between conventional financial institutions and independent agents in developing financial technologies that aid cheaper remittance transfers and financial inclusion in several developing countries, especially in Africa. This also includes the broad adoption of cryptocurrency in transferring remittances, a subject this study evaded due to the complexity of accessing such data. However, it is crucial to investigate how the competition between banks and non-bank agents affects transfers and the effectiveness of remittances in developing countries.

Third, our study in Nigeria uses cross-sectional data from a single survey, thereby precluding us from accessing the temporal changes in labor supply over several periods in response to remittances. Obviously, the persistence of remittances over the years may affect labor supply decisions beyond transfers recorded over only one period. For instance, Amuedo-Dorantes and Pozo (2012) argue that the volatility of remittances affects labor supply differently. Moreover, recipients may also change occupations from formal to informal sectors, or vice versa, while maintaining similar hours worked. These are avenues for future research.

Lastly, the current study has dwelled on the financial aspect of migrants' transfers. However, there is increasing evidence that migrants, especially transnational entrepreneurs, send non-financial remittances that are directly invested in enterprises in their home countries. Moreover,

non-financial remittances may be driven by unique factors, thus making their development effect different from that of financial transfers. Other research avenues include the implication of remittances for transitioning from traditional energy to modern clean energy sources in developing countries, access to clean water sources, and mitigating the effects of climate change.

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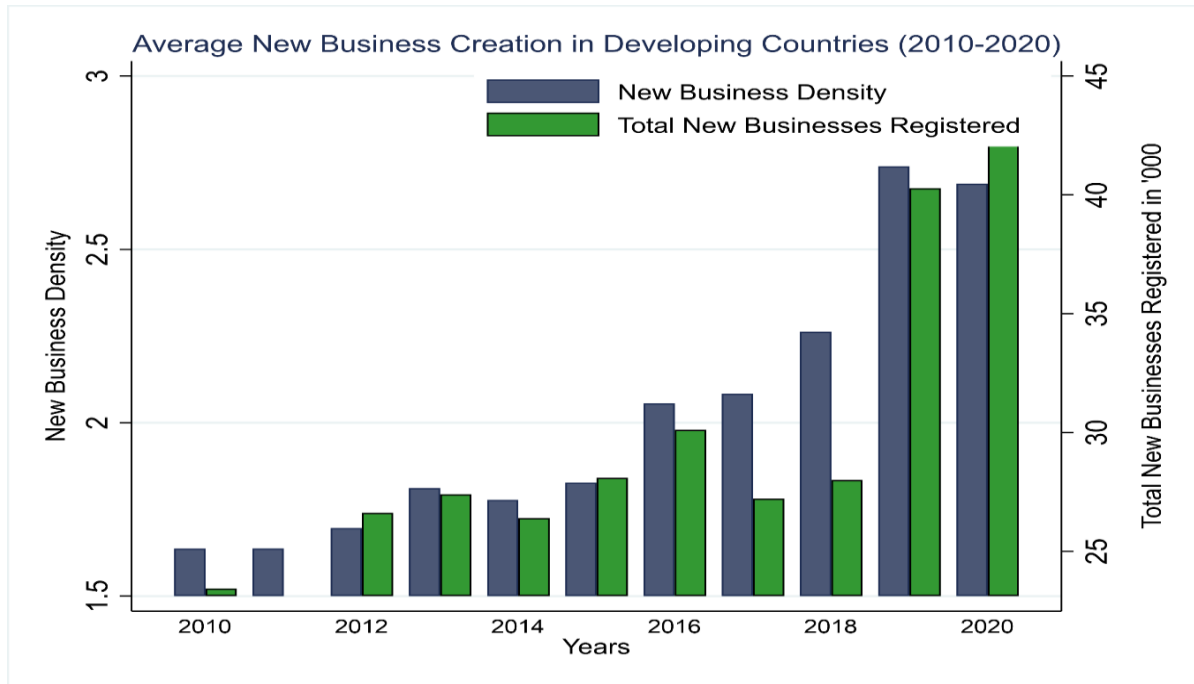
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Appendix

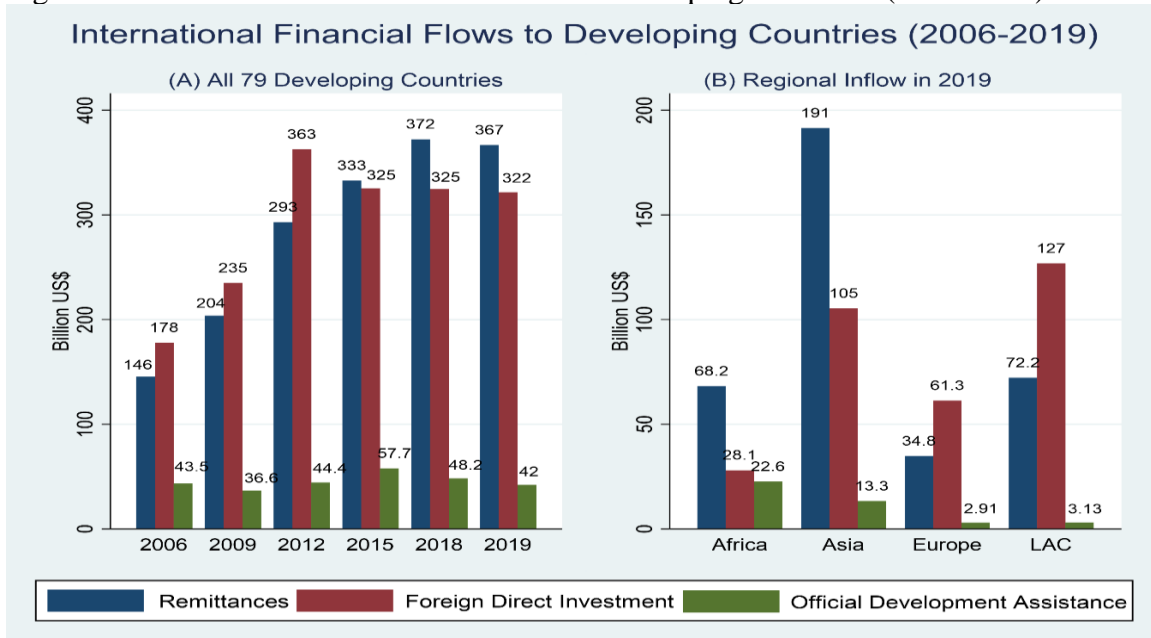
Appendix to Chapter 1

Figure A1.1: New Business Creation in Developing Countries (2010-2020)



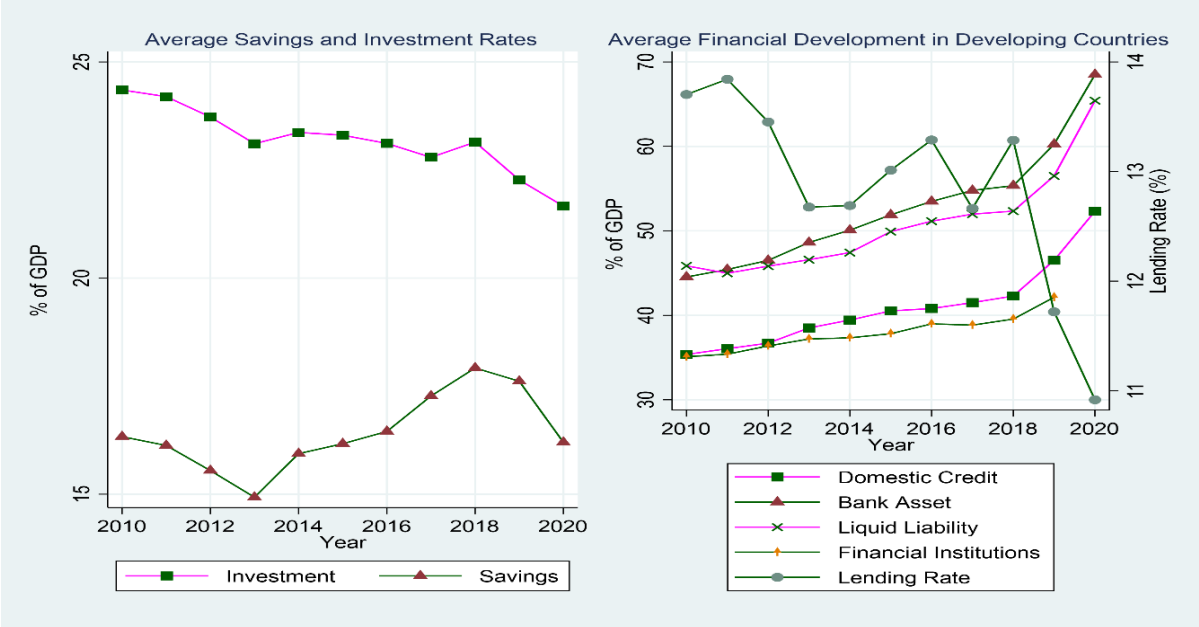
Source: Authors' Computation from (World Bank Entrepreneurship Survey Data, 2021a)

Figure A1.2: International Financial Flows to Developing Countries (2006-2019)



Source: Authors' Computation from WDI: (World Bank, 2021c)

Figure A1.3: Savings, Investment and Financial Developing in Developing Countries



Source: Authors' Computation from (World Bank, 2021b) and (IMF, 2021)

Appendix to Chapter 3

Table A3.1: The List of Countries Used in Chapters 4 and 5

Country	Chapters Used	Country	Chapters Used	Country	Chapters Used
Albania	4.3, 5	Gabon	4.2, 4.3, 5	Niger	5
Algeria	4.2, 4.3, 5	Gambia, The	4.3, 5	Nigeria	4.2, 4.3, 5
Angola	5	Georgia	4.3, 5	North Macedonia	4.3, 5
Argentina	4.2, 4.3, 5	Ghana	4.2, 4.3, 5	Pakistan	4.2, 4.3, 5
Armenia	4, 4.3, 5	Guatemala	4.2, 4.3, 5	Paraguay	5
Azerbaijan	4, 4.3, 5	Guinea	4.3, 5	Peru	4.2, 4.3, 5
Bangladesh	5	Guinea-Bissau	5	Philippines	4.2, 4.3, 5
Belarus	4.3, 5	Honduras	5	Romania	4.3
Belize	4.2, 4.3	India	4.2, 4.3, 5	Russia	4.3, 5
Benin	4.2, 4.3, 5	Indonesia	4.2, 4.3, 5	Rwanda	4.2, 4.3, 5
Bhutan	4.2, 4.3, 5	Iraq	4.3	Senegal	4.2, 4.3, 5
Bolivia	5	Iran, Islamic Rep.	5	Serbia	4.3
Bosnia and Herzegovina	5	Jamaica	4.2, 4.3, 5	Sierra Leone	4.2, 4.3, 5
Botswana	4.2, 4.3, 5	Jordan	4.3, 5	South Africa	4.2, 4.3, 5
Brazil	4.2, 4.3, 5	Kazakhstan	4.2, 4.3, 5	South Sudan	4.3
Bulgaria	4.3, 5	Kenya	5	Sri Lanka	4.2, 4.3, 5
Burkina Faso	5	Kyrgyz Republic	4.2, 4.3, 5	Sudan	5
Burundi	5	Lao PDR	4.2, 5	Suriname	4.2, 4.3, 5
Cabo Verde	4.2, 4.3, 5	Lebanon	5	Syrian Arab Republic	5
Cambodia	4.2, 4.3	Lesotho	4.2, 4.3, 5	Tajikistan	4.2, 4.3, 5
Central African Rep.	4.3	Liberia	4.2, 5	Tanzania	4.3, 5
Chad	4.3	Madagascar	5	Thailand	4.2, 4.3, 5
Cameroon	5	Malawi	5	Timor-Leste	4.2, 4.3
China	5	Malaysia	4.2, 4.3, 5	Togo	4.2, 4.3, 5
Colombia	4.2, 4.3, 5	Maldives	4.3, 5	Tonga	4.2, 4.3
Comoros	5	Mali	4.2, 4.3, 5	Tunisia	4.2, 4.3, 5
Congo, Dem. Rep.	4.3, 5	Mauritius	4.2, 4.3, 5	Turkey	4.3, 5
Congo, Rep.	5	Mexico	4.2, 4.3, 5	Uganda	4.2, 4.3, 5
Costa Rica	4.2, 4.3, 5	Moldova	5	Ukraine	4.3, 5
Cote d'Ivoire	4.2, 4.3, 5	Mongolia	4.2, 4.3, 5	Uzbekistan	4.2, 4.3
Dominican Republic	4.2, 4.3, 5	Montenegro	4.3	Venezuela, RB	5
Ecuador	5	Morocco	4.2, 4.3, 5	Vanuatu	4.2, 4.3
Egypt, Arab Rep.	4.3, 5	Mozambique	4.3, 5	Vietnam	4.3, 5
El Salvador	4.2, 4.3, 5	Myanmar	4.2, 4.3, 5	Yemen, Rep.	5
Eswatini	4.3, 5	Namibia	4.2, 4.3, 5	Zambia	4.2, 4.3, 5
Ethiopia	5	Nepal	4.2, 4.3, 5	Zimbabwe	4.3, 5
Fiji	5	Nicaragua	5		

Table A3.2: Remittances, E-government, and Entrepreneurship - Variables and Sources

Variables	Description	Sources	Expected Signs
New Business Density	New business density (New business registration by the private sector per 1000 working-age population)	WB Entrepreneurship Database	
Remittances	Annual remittances per capita received by each country in US\$	World Development Indicators	+
E-government Index	Measures the ability of the governments of UN member nations to use ICT in augmenting public service delivery; 0-1 (>0, better)	UN E-Government Database	+
Online services index	Measures the ability of governments to disseminate information and offer services using digital platforms; 0-1 (>0, better)	UN E-Government Database	+
Human capital index	Measures the ability of citizens to use and promote ICT; 0-1 (>0, better)	UN E-Government Database	+
Telecom infrastructure index	Measures the development of infrastructures that enables citizens to partake in e-government electronically; 0-1 (>0, better)	UN E-Government Database	+
E-participation index	Measures the extent to which governments engage their citizens and the participatory ability of the citizens in governance processes; 0-1 (>0, better)	UN E-Government Database	+
GDP growth rate	Gross domestic product annual growth rate	World Development Indicators	+
GDP per capita	Annual real GDP per capita in US\$	World Development Indicators	+
Economic globalization index	KOF economic globalization index is an overall measure of both trade and financial openness indices (0-100)	KOFGI, Dreher (2006); Gygli et al. (2019)	+
Government spending	Government financial consumption expenditure as a percentage of GDP	World Development Indicators	-
Financial development	The depth, access, and efficiency of financial institutions such as banks, insurance companies, mutual funds, and pension funds (0-1)	IMF FD: Sviryzdenka (2016)	+
Unemployment rate	Unemployment rate (annual percentage of the total labor force)	World Development Indicators	+
Property right	The protection of private property rights by the law and the extent to which the laws are respected; 0-10 (higher values indicate property right protection)	Fraiser Institute; Economic freedom of the world (2020)	+
Political stability	The likelihood of government destabilization and ousting through unconstitutional means in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+
Voice and accountability	The freedom of association, expression, media, and the ability to participate in the government selection process in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+
Regulatory quality	The ability of governments to promote private sector development through effective policies in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+
Corruption control	The control of corrupt practices such as exercising public power for private gains in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+
Rule of law	The extent of law enforcement, compliance with societal rules and contract enforcement in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+
Government effectiveness	The independence of civil service and the quality and implementation of public services in percentile rank (0–100)	WGI, Kaufman et al. (2010)	+

TableA3.3: Remittances, Financial Development, and Entrepreneurship - Variables and Sources

Variables	Description	Sources	Expected Signs
Dependent Variables			
New Business Density	New businesses registered by private corporations with limited liability per 1000 working-age population	WB Entrepreneurship Database	
Total Business Density	The stock of all registered private businesses with limited liability per 1,000 working age population	WB Entrepreneurship Database	
Remittances	Annual remittances per capita received by a country in US\$	World Development Indicators	+
Financial Development			
Domestic credit	Domestic credit extended to the private sector by money deposit institutions (banks) as a percentage of GDP	Global Financial Development Database, World Bank	+
Liquid liability	Broad money including currency, savings deposits, and transferable deposits as a percentage of GDP	Global Financial Development Database, World Bank	+
Interest rate (lending)	The short- and medium-term lending rate to the private sector in percentage.	World Development Indicators	-
Bank assets	The total assets held by deposit money banks including their claims on domestic nonfinancial real sector (governments, public enterprises, and the private sector) as a percentage of GDP	Global Financial Development Database, World Bank	+
Fin. Inst. Dev. index	The depth, access to and the efficiency of financial institutions such as banks, insurance companies, mutual funds, pension funds, and other nonbank institutions (0-100)	IMF FD: Svirydzienka (2016)	+
Fin. Inst. Access	Access to financial institutions measured by ATMs & bank branches	IMF FD: Svirydzienka (2016)	+
Fin. Mkt. index	The depth, access, and efficiency of financial (stock) markets	IMF FD: Svirydzienka (2016)	+
Fin. Mkt. access	Access to financial markets	IMF FD: Svirydzienka (2016)	+
Stock mkt cap.	The ratio of stock market capitalization to GDP	World Development Indicators	+
Stocks traded	The value of traded stocks to GDP	World Development Indicators	+
Control Variables			
GDP growth rate	Gross domestic product annual growth rate	World Development Indicators	+
GDP per capita	Annual real GDP per capita in US\$	World Development Indicators	+
Trade openness	Trade is the sum of exports and imports of goods and services measured as a percentage of GDP.	World Development Indicators	+
Government spending	Government financial consumption expenditure as a percentage of GDP	World Development Indicators	-
Institutional quality	An average of all World Governance Indicators variables in percentile rank (0-100)	WGI, Kaufman et al. (2010)	+
Unemployment rate	Unemployment rate (annual percentage of the total labor force)	World Development Indicators	+
Population growth rate	Annual population growth rate per country	World Development Indicators	+
Days to start biz.	The number of calendar days needed to complete the procedures to legally operate a business.	World Development Indicators	-
Inflation rate	The annual inflation rate measured by consumer price index	World Development Indicators	-

Education	Gross secondary school enrollment rate	World Development Indicators	+
Investment	Gross fixed capital formation as a percentage of GDP	World Development Indicators	+
Corruption control	Efforts to control corrupt practices	WGI, Kaufman et al. (2010)	+
Property rights	The provision of property rights to the citizens of a country	Fraiser institute	+
Int'l trade freedom	The freedom for businesses to engage in international trade	Fraiser institute	+

TableA3.4: Remittances, Poverty, and Income Inequality - Variables and Sources

Variables	Description	Sources	Expected Signs
Poverty headcount	Poverty headcount ratio at US\$1.90	World Bank: WDI	
Gini	Gini coefficient as a measure of income inequality	UN-WIID	
Remittances	Annual remittances per capita received by each country in US\$	World Bank: WDI	-/+
E-government Index	Measures the ability of the governments of UN member nations to use ICT in augmenting public service delivery; 0-1 (>0, better)	UN E-Government Database	-
Online services index	Measures the ability of governments to disseminate information and offer services using digital platforms; 0-1 (>0, better)	UN E-Government Database	-
Human capital index	Measures the ability of citizens to use and promote ICT; 0-1 (>0, better)	UN E-Government Database	-
Telecom infrastructure index	Measures the development of infrastructures that enables citizens to partake in e-government electronically; 0-1 (>0, better)	UN E-Government Database	-
E-participation index	Measures the extent to which governments engage their citizens and the participatory ability of the citizens in governance processes; 0-1 (>0, better)	UN E-Government Database	-
GDP growth rate	Gross domestic product annual growth rate	World Bank: WDI	-
Trade globalization index	KOF trade globalization index is an overall measure that captures both de facto and de jure components of trade openness; (0-100) > 0 is more openness	KOFGI, Dreher (2006); Gygli et al. (2019)	-
Financial inclusion index	A composite index of financial institutions branches, deposit accounts, loan accounts, depositors, borrows and automated teller machine measured from 0 to 1.	IMF: Financial Access Survey (2022)	-
Unemployment rate	Unemployment rate (annual percentage of the total labor force)	World Bank: WDI	+
Corruption	This is a measure of the perception of the extent of corruption in the public sector	Coppedge et al. (2020)	+
Internet	Percentage of population that uses the internet	World Bank: WDI	+
Rural population	The percentage of people living in rural areas per country	World Bank: WDI	+
Shadow economy	The proportion of the size of informal economy in a country's GDP	Medina and Schneider (2019)	+

Table A3.5: Summary Statistics - Individual, Household, and Community Levels

Variables	Details	Mean	SD	Obs.
Individual Level Variables				
Male	= 1 if the individual is a male, 0 if female	0.48	0.50	61169
Age	Age in years	33.37	13.85	61169
educ_yr	Years of education	10.18	6.07	61169
No formal educ	Individual has no formal education	0.14	0.34	61169
Primary educ	Attained primary level education	0.32	0.47	61169
Secondary educ	Attained secondary level education	0.42	0.49	61169
Post-secondary educ	Attained post-secondary level education	0.13	0.33	61169
married	Dummy = 1 if individual is married	0.45	0.50	61169
wage_work	= 1 if individual works in a wage job, 0 otherwise	0.12	0.33	61169
Wage work hours	Hours worked in wage job	43.83	15.60	6319
agric_work	= 1 if individual works own agriculture, 0 otherwise	0.36	0.48	61169
Agric work hours	Hours worked in agricultural self-employment	26.60	16.23	25885
nfe_work	= 1 if individual works in own NFE, 0 otherwise	0.30	0.46	61169
NFE hours	Hours worked in NFE	40.17	19.61	16963
Agric work land	= 1 if individual owns a farmland, 0 otherwise	0.21	0.40	61169
Household Level Variables				
Remittances	= 1 for international remittance household	0.054	0.23	21193
Remittances amount	Total amount received in cash and kind (Naira)	165953.70	704011.80	868
depratio_u5	HH dependency ratio (children under 5yrs)	0.20	0.20	21193
HH size	Number of individuals per household	5.23	3.17	21193
HH male head	= 1 if household head is a male, 0 otherwise	0.83	0.37	21193
HH head literate	= 1 if household head is literate, 0 otherwise	0.59	0.49	21193
HH NFE	= 1 if household has at least 1 non-farm enterprise	0.63	0.48	21193
HH income	Average income per household	157784.5	471829.8	21193
Community Level Variables				
share in wage work	Share of people in wage jobs in the community	0.08	0.07	2213
share 15+ in agric work	Share of people in agriculture in the community	0.21	0.17	2213
share 15+ in NFE	Share of people in NFE in the community	0.18	0.09	2213
share 15+ unemp	Share of people unemployed in the community	0.16	0.09	2213
Infrastructure: road	= 1 if community has a road network	0.80	0.40	2210
Infrastructure: school	= 1 if community has a school	0.95	0.22	2210
urban	= 1 if community is in an urban area	0.40	0.49	2213
zone	Zonal dummies	3.92	1.75	2213
Migration network	Ratio of remittance households in the community	0.06	0.10	2213
Avr. Comm*Rem	Average remittance per community with improved communication system	10151.22	71913.64	2210

Table A3.6: Summary Statistics - Enterprise Level

Variables	Details	Mean	SD	Obs.
Informal	= 1 if the NFE is informal	0.91	0.29	17347
Total employment	Number of employees	1.36	1.81	17347
revenue	Average revenue per enterprise	81043.22	344655.90	17347
Agric-based	= 1 if NFE is agric-based	0.01	0.10	17347
Mining & construction	= 1 if NFE is in mining & construction	0.03	0.16	17347
Manufacturing	= 1 if NFE is in manufacturing	0.13	0.34	17347
Services	= 1 if NFE is in services other than trade	0.32	0.47	17347
Trade	= 1 if NFE is trade	0.51	0.50	17347
Loan	= 1 if NFE successfully borrowed money	0.12	0.33	17347

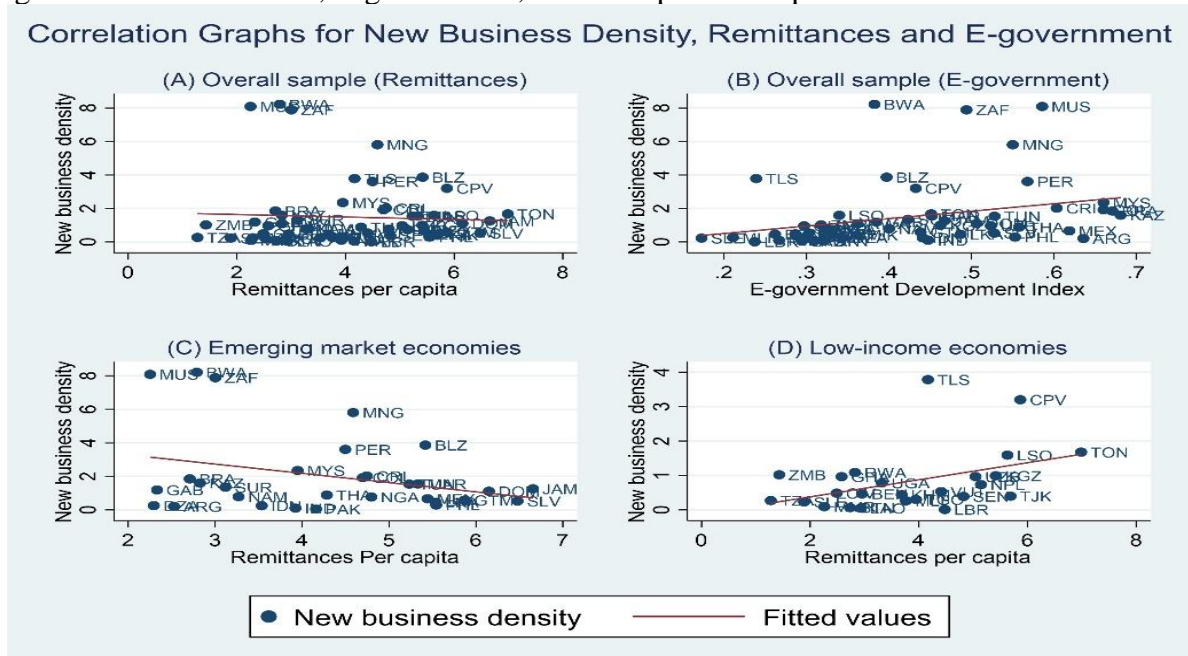
Appendix to Chapter 4

Appendix A4: Remittances, E-government, and Formal Entrepreneurship

Table A4.1: Remittances, E-government, and Entrepreneurship - Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
New Business Density	334	1.37	1.87	.01	10.21
Remittances	332	151.15	214.07	.37	1821.74
E-government Index	334	.43	.15	.13	.84
Online services index	334	.4	.23	0	.95
Human capital index	334	.64	.17	.17	.98
Telecom infrastructure index	334	.24	.17	0	.76
E-participation index	334	.34	.27	0	.97
GDP growth rate	334	4.32	3.61	-20.6	20.72
GDP per capita	334	7.86	.94	5.93	9.45
Economic globalization index	334	50.74	10.67	25.16	83.27
Government spending	317	15.2	9.3	4.4	115.93
Financial Development	334	.34	.14	.08	.73
Unemployment rate	334	6.81	5.8	.13	28.65
Property rights	315	5	1	2.56	9.07
Rule of Law	334	38.79	18.09	3.32	79.62
Regulatory Quality	334	40.51	17.77	.97	81.73
Government Effectiveness	334	40.48	19.29	2.39	85.44
Political Stability	334	38.15	22.03	.47	93.72
Voice and Accountability	334	41.76	19.58	.48	86.21
Control of Corruption	334	38.85	19.86	.47	91.35

Figure A4.1: Remittances, E-government, and Entrepreneurship - Correlation Plots



Does digitalization limit the proliferation of the shadow economy in African countries? An in-depth panel analysis

In Haruna and Alhassan (2022b), our objective is to investigate the empirical link between digitalization and the shadow economy in Africa. We argue from the modernization theory perspective that the digitalization of government services in Africa could be effective in reducing the large share of informal economic activities on the continent. A potential channel for digitalization-induced reduction in the shadow economy is enterprise formalization, where firms in the informal sectors find it easier to formalize their businesses through online business registration systems. Furthermore, such digitalization of government services includes the dissemination of information crucial to business owners by the government and the digitalization of tax collection procedures to improve revenue generation in Africa.

Our empirical strategy uses unbalanced panel data for 42 African countries between 2003 and 2016, and employs fixed effects and two-stage fixed effects estimators to estimate the following equation:

$$Shadow\ economy_{it} = \beta_0 + \beta_2 Digitalization_{it} + \beta_3 Control_{it} + \gamma_i + \varepsilon_{it} \dots \dots \dots (A)$$

where i and t represent countries and years, respectively; *Shadow economy* refers to the estimated hidden economic activities that are untaxed and unreported; *Digitalization* refers to the adoption of information and communication technology (e-government index, e-participation index, online service index, human capital index, and telecommunication infrastructure index) for digitizing government services. *Control* includes financial depth, financial access, trade (% GDP), GDP growth, population growth, inflation, unemployment, GDP per capita, rural population growth, and institutional quality indicators such as v-dem corruption and polity5; γ_i is the fixed characteristics of country i ; and ε is the error term.

Following Equation (A), we apply the fixed-effect estimator as our baseline method and use the instrumental variable fixed-effect estimator for the robustness check. In addition to our baseline results, we performed several robustness checks, including alternating our dependent variable and using alternative control variables for a sensitivity check. Table A4.2 presents the excerpt results from the full article. As shown in columns (1) and (5), the e-government development index, our measure of digitalization, has a negative and significant relationship with the shadow economy, suggesting that digitalization of public service delivery is associated with a reduction in informal economic activities. As previously stated, one of the channels for the reduction in the shadow economy in the face of digitalization is to ease the formalization of enterprises. This finding is in line with the evidence in column (3) of Table

4.1, in which e-government is positively associated with new formal business creation in developing countries. Furthermore, columns (2) – (4) and (6) – (8) show the relationship between the components of e-government and the shadow economy. In all cases, we find negative and significant relationships. For instance, the availability of online services (OSI) and telecommunication infrastructure (TII) have a significant effect in reducing the size of the shadow economy in Africa.

Table A4.2: The Impact of Digitalization on Shadow Economy in Sub-Saharan Africa

	Dependent Variable: Shadow economy							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP pc	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.001*** (0.001)	-0.001** (0.001)	-0.001** (0.001)	-0.001** (0.001)	-0.001** (0.001)
Fin. Dev.	-2.295*** (0.561)	-2.752*** (0.562)	-2.266*** (0.698)	0.488 (0.559)	-1.165** (0.546)	-1.358** (0.542)	-0.818 (0.668)	0.287 (0.554)
Unemp	0.129 (0.106)	0.122 (0.109)	0.103 (0.111)	0.093 (0.091)	0.034 (0.105)	0.010 (0.105)	0.043 (0.104)	0.015 (0.096)
Trade	-0.028*** (0.009)	-0.032*** (0.009)	-0.036*** (0.011)	-0.034*** (0.008)	-0.023*** (0.009)	-0.022** (0.009)	-0.03*** (0.010)	-0.026*** (0.008)
Egov	-22.38*** (4.083)				-11.265** (4.476)			
E-part		-5.903*** (1.531)				-2.381 (1.468)		
OSI			-1.268*** (0.282)				-0.70*** (0.260)	
TII				-2.234*** (0.191)				-1.883*** (0.268)
Rural pop.					0.440*** (0.083)	0.444*** (0.085)	0.446*** (0.083)	0.077 (0.095)
Pop. growth					-0.150*** (0.048)	-0.15*** (0.048)	-0.15*** (0.049)	-0.090** (0.045)
V-dem corr.					-2.759 (2.667)	-3.955 (2.721)	-1.979 (2.858)	-5.424** (2.492)
Polity5					-0.179 (0.123)	-0.205* (0.123)	-0.203 (0.135)	-0.139 (0.114)
Inflation					-0.008 (0.018)	-0.008 (0.018)	0.000 (0.018)	-0.024 (0.017)
GDP growth					-0.068 (0.042)	-0.088** (0.042)	-0.100** (0.047)	-0.074* (0.039)
Constant	40.964*** (2.554)	35.459*** (2.439)	35.316*** (2.828)	34.010*** (2.059)	17.907*** (6.446)	16.073** (6.427)	15.282** (6.448)	36.024*** (6.599)
R-squared	0.358	0.325	0.315	0.521	0.467	0.460	0.469	0.540
Countries	42	42	42	42	40	40	40	40
No. of obs.	331	331	309	331	315	315	298	315

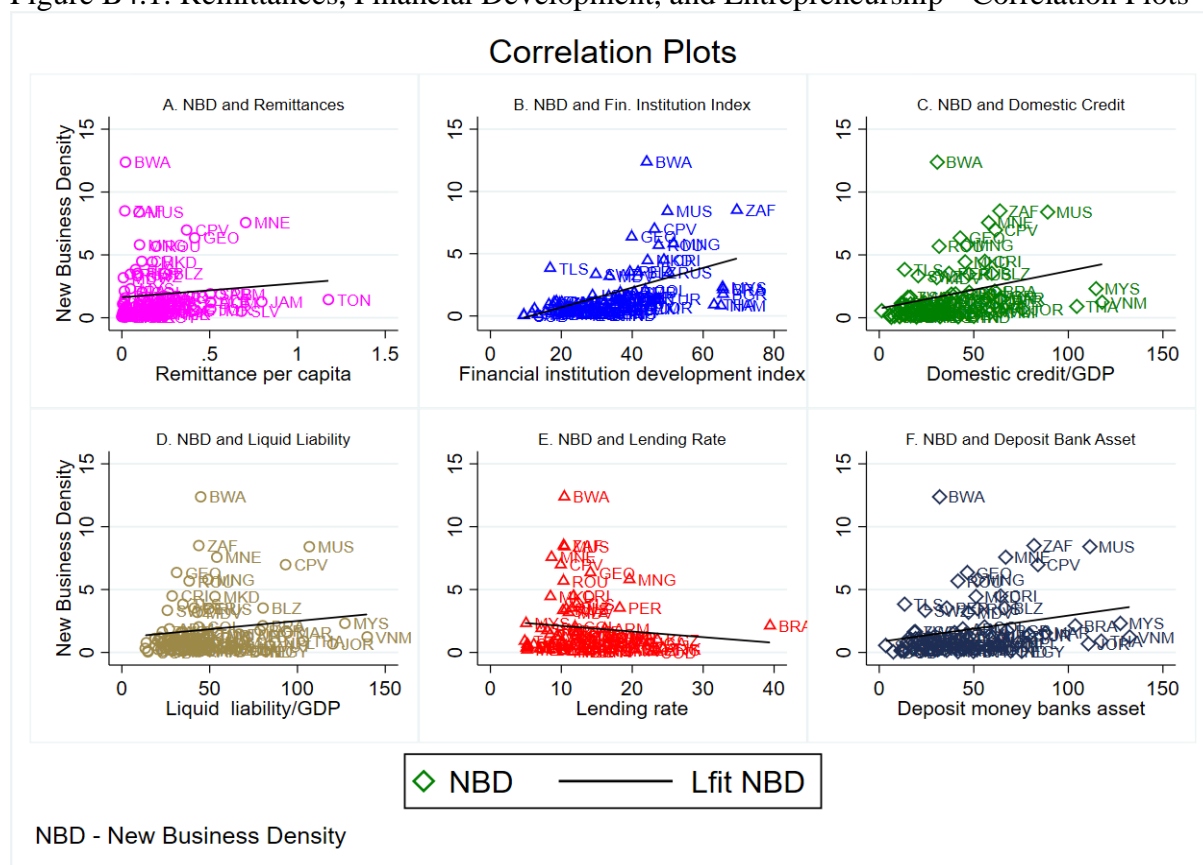
Robust standard errors are in parentheses. ***, **, and * indicate significance at the 1 %, 5 %, and 10% levels, respectively. See Haruna and Alhassan (2022) for the definitions and sources of the variables used in this table.

Appendix B4: Remittances, Financial Development, and Formal Entrepreneurship

Table B4.1: Remittances, Fin. Development and Entrepreneurship - Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
New business density (nbd)	981	1.94	2.66	.02	20.09
Remittances per capita (rem)	977	.19	.24	0	1.82
Domestic credit by banks (dcp)	981	37.84	25.88	.5	147.67
Liquid liability to GDP (ll_gdp)	966	49.37	29.46	7.12	179.65
Lending (interest) rate (int_lend)	794	12.83	6.49	2.95	52.1
Deposit money banks asset (bank_asset)	966	48.64	30.6	.49	162.76
Financial institutions dev. Index (imf_fi)	891	34.64	14.45	7.72	73.97
GDP growth rate (gdpgt)	981	3.64	4.74	-46.08	20.72
GDP per capita (gdppc)	980	8	.88	5.9	9.56
Trade openness (trade)	979	79.88	33.57	11.86	211.5
Unemployment rate (unemp)	981	8.51	6.75	.13	36.03
Institutional quality (inst)	981	39.37	16.47	2.1	77.4
Government expenditure (govexp)	981	15.42	8.71	3.46	115.93
Days to start a business (time)	876	29.03	54.67	1	690
Population growth rate (popgr)	981	1.4	1.14	-1.67	5.42

Figure B4.1: Remittances, Financial Development, and Entrepreneurship - Correlation Plots

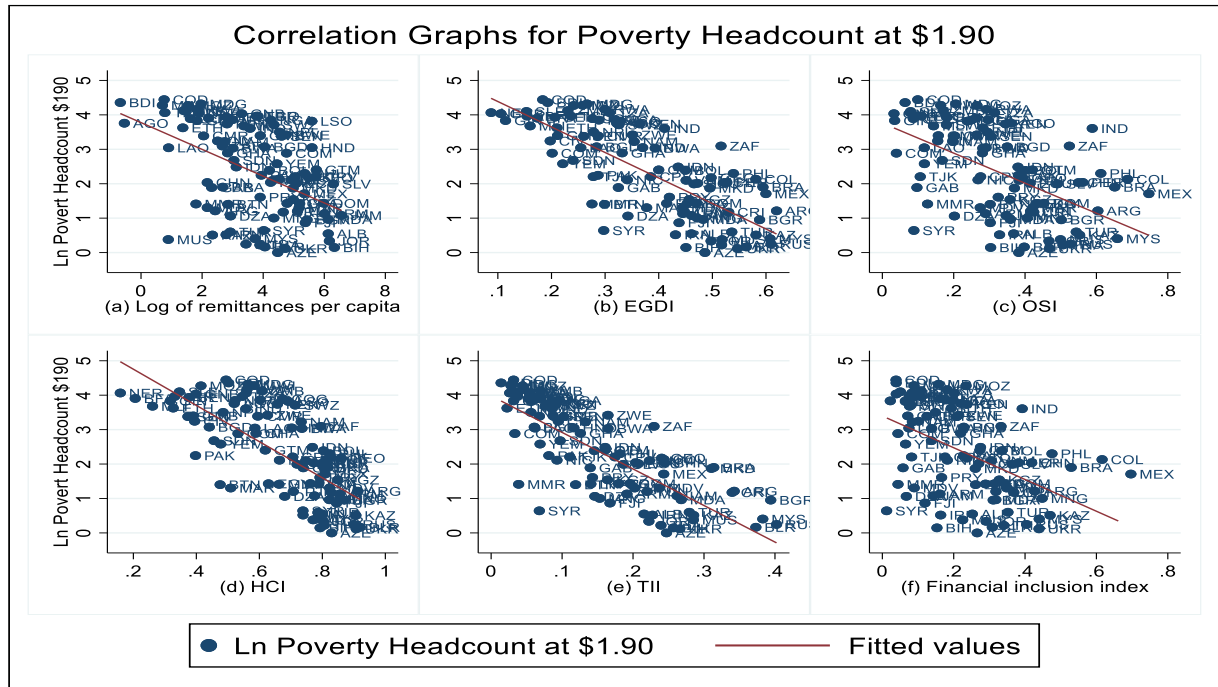


Appendix to Chapter 5

Table A5.1: Remittances, Poverty, and Income Inequality - Summary Statistics

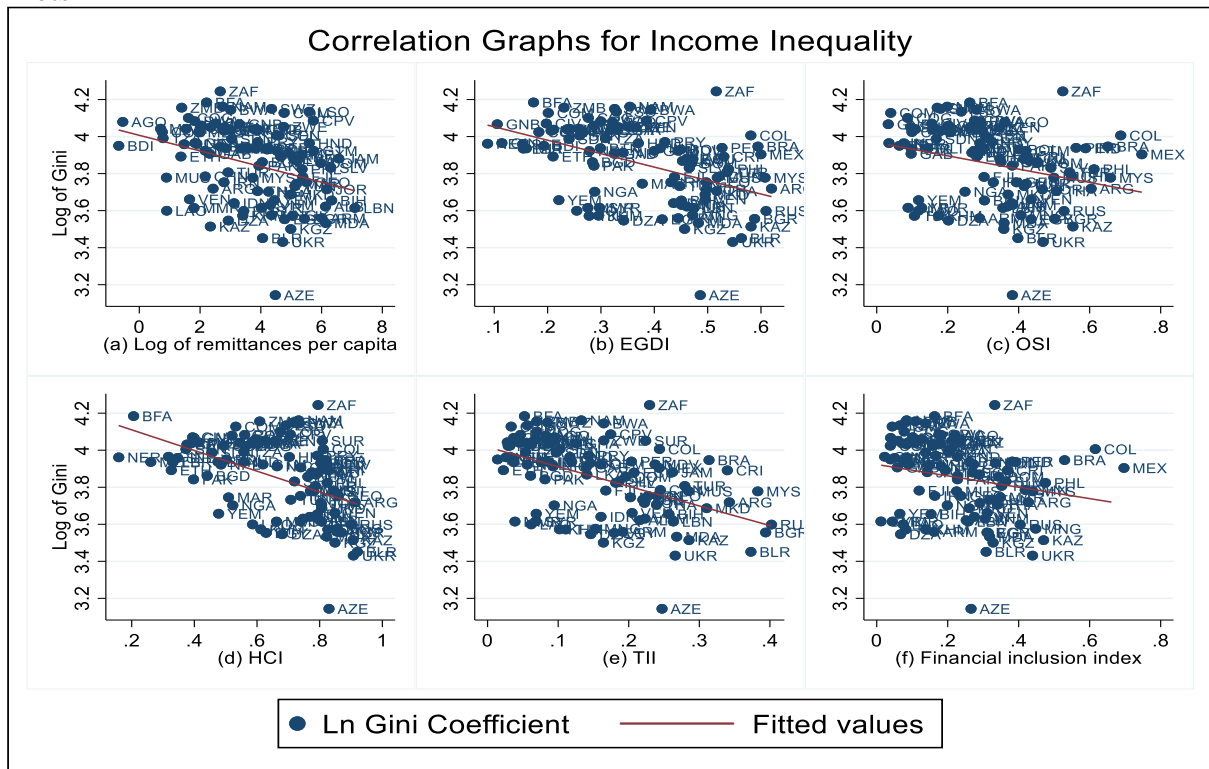
Variable	Obs	Mean	Std. Dev.	Min	Max
Poverty headcount	680	21.0065	22.9047	0	92.1625
Gini_index	828	47.9761	9.786	16.511	74.227
Remittance per capita	828	127.6953	195.0665	.0059	1507.025
E-government	828	.3792	.15	0	.7969
Online service index	828	.3254	.2127	0	.9514
Human capital index	828	.6635	.1939	0	.9759
Telecom infrastructure index	828	.1578	.1432	0	.6881
E-participation index	828	.2267	.2346	0	.9719
Financial inclusion	715	.2345	.1885	.0001	.8808
GDP growth rate	828	4.872	3.5366	-17.0047	27.9615
Trade globalization index	828	48.372	14.5185	15.859	83.714
Unemployment rate	828	7.9916	6.6218	.13	37.25
Corruption	828	.6106	.2217	.031	.961
Rural population (%)	828	51.1223	19.7746	8.13	90.861
Shadow economy	828	35.337	10.0573	8.552	65.7616
Internet users	801	19.7363	20.5434	.0241	81.201

Figure A5.1: Remittances, E-government, Financial Inclusion, and Poverty – Correlation Plots



Source: Author's computation with data from WDI, FAS, UN-WIID, and UN

Figure A5.2: Remittances, E-government, Financial Inclusion, and Inequality – Correlation Plots



Source: Author's computation with data from WDI, FAS, UN-WIID, and UN

Appendix to Chapter 6

Table A6.1: Remittances Dummy and Labor Force Participation – Full Sample

	First- Stage Results			Second-Stage Results		
	(1) remittance	(2) remittance	(3) remittance	(4) wage_work	(5) agric_work	(6) nfe_work
Remittance (Dummy)	--	--	--	.47*** (.106)	-.698*** (.161)	.316*** (.102)
Migration network	.984*** (.019)	.984*** (.019)	.984*** (.019)	--	--	--
Avg. comm rem.	.0000** (.000)	.0000** (.000)	.0000** (.000)	--	--	--
Male = 1	-.002 (.002)	-.002 (.002)	-.002 (.002)	.54*** (.022)	.308*** (.023)	-.124*** (.017)
Age (years)	-.001* (.000)	-.001* (.000)	-.001* (.000)	.124*** (.005)	.022*** (.003)	.154*** (.003)
Agesq	.00** (.00)	.00** (.00)	.00** (.00)	-.001*** (.000)	0*** (.000)	-.002*** (.000)
Years of education	.001*** (.00)	.001*** (.00)	.001*** (.00)	.064*** (.002)	-.008*** (.002)	-.012*** (.002)
Married = 1	-.003 (.002)	-.003 (.002)	-.003 (.002)	.027 (.022)	.066*** (.018)	.111*** (.017)
Dependency ratio	.02*** (.007)	.02*** (.007)	.02*** (.007)	.12** (.052)	-.17*** (.042)	.403*** (.041)
owns non-farm enterprise	.000 (.002)	.000 (.002)	-- (.002)	-.555*** (.023)	-.424*** (.019)	-- (.002)
Household income (log)	.001 (.000)	.001 (.000)	.001* (.000)	.078*** (.004)	.02*** (.003)	.091*** (.004)
Household size	.000 (.000)	.000 (.000)	.000 (.000)	-.017*** (.004)	.01*** (.002)	-.011*** (.002)
Household head_male	-.002 (.005)	-.002 (.005)	-.002 (.005)	-.232*** (.032)	.005 (.026)	-.154*** (.025)
head is literate (English)	-.001 (.003)	-.001 (.003)	-.001 (.003)	.065** (.025)	-.059*** (.02)	.038* (.02)
Owns agric land	-.001 (.002)	-.001 (.002)	-.001 (.002)	-.124*** (.024)	.811*** (.023)	-.048** (.02)
Unemployment rate	.000 (.000)	.000 (.000)	.000 (.000)	-.002 (.001)	-.055*** (.001)	-.016*** (.001)
Infrastructure: road	-.003 (.002)	-.003 (.002)	-.003 (.002)	.172*** (.034)	-.051* (.028)	.232*** (.031)
Infrastructure: school	.001 (.002)	.001 (.002)	.001 (.002)	.163*** (.062)	-.158*** (.04)	.259*** (.054)
Urban area	-.003 (.002)	-.003 (.002)	-.003 (.002)	.292*** (.028)	-.559*** (.037)	.292*** (.025)
Constant	-.008 (.009)	-.008 (.009)	-.008 (.009)	-5.511*** (.124)	.369*** (.076)	-4.77*** (.093)
Observations	61082	61082	61082	61082	61082	61082
Exogeneity (chi2)	--	--	--	17.681	14.208	8.244
p-value of exogeneity	--	--	--	.000	.000	.004
ALM (Chi ²) P-value	--	--	--	0.16	0.11	0.54
Regional Dummies	YES	YES	YES	YES	YES	YES

*Robust standard errors are in parentheses; *** p<.01, ** p<.05, * p<.1.*

ALN is the Amemiya-Lee-Newey minimum chi-sq statistic for overidentifying restrictions. columns (1), (2), and (3) present the first stage results for the second stage results in columns (4), (5), and (6), respectively.

Table A6.2: First State Regressions for Tables 6.2 and 6.3

	IVPROBIT/2SLS			IVTOBIT			Heckman
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	wage_work	agric_work	nfe_work	wage_hr	agric_hr	nfe_hr	Rem(log)
Migration network	10.835*** (.224)	10.838*** (.224)	10.832*** (.224)	10.836*** (.224)	10.834*** (.224)	10.833*** (.224)	10.833*** (.234)
Avg. comm rem.	.000*** (.000)	.000*** (.000)	.000*** (.000)	.000*** (.000)	.000*** (.000)	.000*** (.000)	0*** (0)
Male = 1	-.018 (.019)	-.018 (.019)	-.018 (.019)	-.018 (.019)	-.018 (.019)	-.018 (.019)	-.018 (.019)
Age (years)	-.006* (.003)	-.006 (.003)	-.006* (.003)	-.006* (.003)	-.006* (.003)	-.006* (.003)	-.006* (.003)
Agesq	.000** (.000)	.000** (.000)	.000** (.000)	.000** (.000)	.000** (.000)	.000** (.000)	0** (0)
Years of education	.012*** (.002)	.012*** (.002)	.012*** (.002)	.012*** (.002)	.012*** (.002)	.012*** (.002)	.012*** (.002)
Married = 1	-.035 (.022)	-.035 (.022)	-.035 (.022)	-.035 (.022)	-.035 (.022)	-.035 (.022)	-.035* (.019)
Dependency ratio	.222*** (.079)	.222*** (.079)	.221*** (.079)	.222*** (.079)	.222*** (.079)	.221*** (.079)	.222*** (.05)
owns non-farm ent	-.003 (.027)	-.003 (.027)	- (-)	-.003 (.027)	-.003 (.027)	- (-)	-.003 (.016)
HH income (log)	.008 (.005)	.008 (.005)	.007 (.005)	.008 (.005)	.008 (.005)	.007 (.005)	.008** (.003)
Household size	.003 (.004)	.003 (.004)	.003 (.004)	.003 (.004)	.003 (.004)	.003 (.004)	.003* (.002)
HH head_male	-.023 (.059)	-.023 (.059)	-.023 (.059)	-.023 (.059)	-.023 (.059)	-.023 (.059)	-.023 (.033)
head is literate	-.011 (.033)	-.011 (.033)	-.011 (.033)	-.011 (.033)	-.011 (.033)	-.011 (.033)	-.011 (.018)
Owns agric land	-.017 (.023)	-.017 (.023)	-.017 (.023)	-.017 (.023)	-.017 (.023)	-.017 (.023)	-.017 (.023)
Unempl rate	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)
Infrastructure: road	-.045** (.022)	-.045** (.022)	-.045** (.021)	-.045** (.022)	-.045** (.022)	-.045** (.021)	-.045** (.019)
Infrastructure: sch	.014 (.021)	.014 (.021)	.013 (.02)	.014 (.021)	.014 (.021)	.013 (.02)	.014 (.017)
Urban area	-.018 (.024)	-.018 (.024)	-.018 (.024)	-.018 (.024)	-.018 (.024)	-.018 (.024)	-.018 (.022)
Constant	-.113 (.097)	-.113 (.097)	-.112 (.096)	-.113 (.097)	-.113 (.097)	-.112 (.096)	-.113 (.072)
Observations	61082	61082	61082	61082	61082	61082	61082
Regional Dummies	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses; *** $p < .01$, ** $p < .05$, * $p < .1$

Table A6.3: Average Income per Income Quartile

Income Quantiles	Obs.	Mean	SD	Min	Max
HH income Q1	4924	10322.22	8817.01	0	25000
HH income Q2	5323	44959.16	11576.24	25200	66950
HH income Q3	5467	101641.84	24127.04	67000	150000
HH income Q4	5479	456290.5	861964.26	150013	28891500