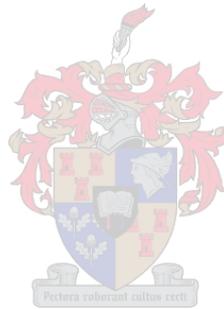


**VOLATILITY OF CAPITAL INFLOWS, ECONOMIC
GROWTH AND FINANCIAL DEVELOPMENT
IN SUB-SAHARAN AFRICA**



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Doctor of Philosophy (PhD) in Development Finance
at the University of Stellenbosch

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

In recent years, private capital flows to sub-Saharan Africa have increased considerably, becoming a major source of economic financing. Not only have private capital flow levels become important but also private capital flow volatility patterns. Many sub-Saharan African countries may not have the capacity to deal with pro-cyclical private capital flows (and subsequent reversals) which may impact on their macroeconomic performance. There is much controversy concerning the use of unrestricted financial openness policies as they could lead to crisis episodes and external shocks brought on by private capital flow volatility.

The study conducts an investigation into the determinants and consequences of private capital flow volatility in sub-Saharan Africa. Specifically, the study addresses the following four questions: (a) What are the determinants of private capital flow volatility? (b) Is there a relationship between remittance volatility and financial sector development? (c) Is there a relationship between cross-border banking volatility (loans and deposits) and economic growth? (d) Is there a relationship between financial openness and output volatility?

The results of the study have been organized into four empirical essays. The first essay investigates the determinants of foreign direct investment (FDI), portfolio equity and cross-border bank lending inflows. The panel data models are estimated using the Augmented Mean Group (AMG) estimator to account for cross-section dependence. The results show that: (1) Global liquidity lowers FDI volatility while for middle-income countries (MICs) global liquidity and global risk are significant drivers of FDI volatility; (2) Global risk increases portfolio equity volatility with the quality of macroeconomic policies and financial openness found to be important pull factors in lowering portfolio equity volatility; and (3) Financial openness and depth lowers cross-border bank lending volatility. For low-income countries (LICs), global liquidity lowers cross-border bank lending volatility while the quality of macroeconomic policies is an important pull factor in lowering volatility. Because global push factors are significant determinants of private capital flow volatility, sub-Saharan African countries should seek ways to strengthen their ability to deal with volatile episodes. Effective monitoring of capital flows, better trained and qualified staff, and greater sub-Saharan African country representation in international financial institutions to enable broader policy coordination is recommended. Positively, some of the results imply that prudent macroeconomic policies as pull factors can lower volatility.

The second essay investigates whether remittance volatility impacts on financial sector development. Using panel data estimation techniques, the empirical evidence from this essay reveals that remittance volatility is detrimental to both banking sector depth and efficiency. No evidence is found that remittance volatility is related to stock market development. Sub-Saharan African countries should have measures in place to monitor the predictability of remittances. A policy question regarding the cost of remittance transfer is necessary. Sub-Saharan Africa remains the most expensive region to send money to and lowering transaction costs should result in more remittances being channelled through formal channels, making flows more predictable and less volatile. More competition among money transfer operators could possibly reduce the cost of remittance transfer and should be investigated.

The third essay investigates whether cross-border banking volatility impacts on economic growth. Using a panel Generalized Method of Moments (GMM) estimation technique, this essay provides evidence that cross-border bank deposit volatility is detrimental to economic growth when the sample includes only resource-rich developing countries (RRDCs). The results further indicate that cross-border bank deposit flows contribute to economic growth in sub-Saharan Africa, but no evidence is found that cross-border bank lending is related to economic growth. RRDCs should have measures in place to monitor the predictability of bank deposit flows. Policy makers should further investigate ways to make banking less expensive for deposit customers as high minimum balance requirements and fees for account holders are prevalent in many African countries. The feasibility of investigating explicit deposit insurance within sub-Saharan Africa should be investigated as only a limited number of African countries have explicit deposit insurance.

The fourth and last essay investigates whether financial openness is a source of output volatility. The essay investigates how financial openness impacts on output volatility through the channel of volatile FDI flows. The panel data models are estimated using the AMG estimator to account for cross-section dependence. The findings of this essay are as follows: (1) financial openness increases output volatility, (2) no evidence is found that FDI volatility is related to output volatility, (3) the extent to which financial openness increases output volatility does not depend on the degree of FDI volatility, and (4) for MICs, financial openness increases output volatility while for LICs increased trade openness and a higher level of economic development reduces output volatility. The results in this essay support the view that some countries may need to open up their capital markets using a more gradual approach.

In conclusion, the combined evidence reveals that sub-Saharan African countries should be concerned with not only private capital flow levels, but also the volatility of such flows. The significance of global push factors as determinants of private capital flow volatility is highlighted. While not disputing the relative stability of remittances relative to other private capital flow types, this study reveals that remittance volatility is not trivial and impacts on banking sector development. The results further indicate that cross-border bank loans and deposits require a differentiated analysis. This thesis concluded by indicating that financial openness remains a controversial policy option in sub-Saharan Africa and is a source of output volatility.

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DEDICATION

I dedicate this thesis to my lovely wife Melissa whom I was fortunate to marry during this PhD journey. Your sacrifice, love and support I will always treasure. This thesis is further dedicated to my parents, Jan and Sharlie Opperman, on whose support and encouragement I could always count.

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criterion
AMG	Augmented Mean Group
ARDL	Autoregressive Distributed Lag
BIS	Bank for International Settlements
CD	Cross-section dependence test
CIPS	Cross-sectionally Augmented Panel Unit Root Test
CPI	Consumer Price Index
DSGE	Dynamic Stochastic General Equilibrium
FDI	Foreign Direct Investment
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HIPC	Heavily Indebted Poor Countries
HP	Hodrick-Prescott
IMF	International Monetary Fund
IPS	Im-Pesaran-Shin
LIC	Low-income Country
LSDV	Least-squares Dummy Variables
MIC	Middle-income Country
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development

RMSE	Root mean square error
OLS	Ordinary Least Squares
RRDC	Resource-rich Developing Country
VIX	Volatility Index (of Standard & Poor's 500)
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Background

Private capital flows to sub-Saharan Africa are currently larger than official development assistance (ODA) and have increased considerably in recent years. For instance, inward foreign direct investment (FDI) increased from less than US\$15 billion in 2001 to approximately US\$37 billion in 2011, while cross-border bank lending increased from US\$60 billion in 2000 to US\$138 billion in 2012 (Hou, Keane, Kennan, Massa, & te Velde, 2013).

Sub-Saharan African countries are different in the structure of their economies compared to the rest of the world. Public infrastructure investment, agriculture, and an increasingly buoyant services sector are key growth drivers in the region while large budgetary imbalances in several countries are a source of vulnerability to exogenous shocks (World Bank, 2014). Many sub-Saharan African countries also rely on export markets for growth (Allen & Giovannetti, 2011). Berman and Martin (2012) showed that exporting countries from the region are more vulnerable than other groups of countries to banking crises in the countries to which they were exporting. Contagion from global factors are not the only concern. The Ebola outbreak has demonstrated that growth would slow not only in the core countries, but also in the region through disruptions in transportation, cross-border trade, and supply chains (World Bank, 2014). Therefore, the potential spill over of economic factors and behaviours across countries in the region present a complex problem of heterogeneity and cross-section dependence which studies need to take into consideration.

High levels of poverty, and low levels of income and domestic savings in the region necessitate external capital to spur investment and growth (Asiedu, 2002). As at June 2010, 33 out of 48 sub-Saharan African countries were classified as Heavily Indebted Poor Countries (HIPC) (Adenutsi, Aziakpono, & Ocran, 2012). Private capital flows have been promoted by African policy makers and developmental partners as important investment vehicles to address Africa's growth problem (Agbloyor, Abor, Adjasi, & Yawson, 2014).

In the late 1980s many sub-Saharan African countries opted for major policy reforms and market-friendly initiatives driven by Bretton Woods institutions and referred to as "structural

adjustment programs”. Financial and trade liberalization were major aspects of these reforms (Ahmed, 2013). Subsequently, many sub-Saharan African countries have implemented policies to liberalize their financial sectors, including easing or lifting interest rate ceilings, reducing interference in the credit market, privatizing state-owned commercial banks, and lowering entry barriers and compulsory reserve requirements (Misati & Nyamongo, 2012). In addition, a host of countries started to develop local stock markets while the entry of foreign financial intermediaries was encouraged. Financial-sector policies are central in the debate on how to spur growth and reduce poverty levels in low-income countries (Beck, Fuchs, & Uy, 2009).

Increased capital flows allow countries with insufficient savings to tap into a global pool which can (i) enhance the efficiency of resource allocation, (ii) facilitate technology and management transfer, particularly through FDI, (iii) enable countries to fund welfare-enhancing current account imbalances (e.g. for productive investment or consumption smoothing), and (iv) enable portfolio diversification. Indirect benefits such as financial sector development, macroeconomic policy discipline, trade, and economic efficiency can also ensue (IMF, 2012b).

There remains much controversy regarding the benefits of financial openness (Ferreiro, Correa, & Gomez, 2009; Aizenman, Jinjarak, & Park, 2013). Critics of financial liberalization contend that higher capital inflows are transitory and can lead to perverse consequences including an overvalued exchange rate, trade deficits, and increased consumption expenditures (Ferreiro et al., 2009). Financial openness can increase vulnerability to crises and external shocks brought on by volatile capital flows (IMF, 2012a; Hwang, Park, & Shin, 2013). Private capital flows were a key channel of crisis transmission for developing economies integrated into international capital markets during the global financial crisis (Essers, 2013).

Capital flow volatility has increased in the past decade and could have numerous economic consequences (Forbes & Warnock, 2012). These include amplifying economic cycles, increasing financial system vulnerabilities, and worsening overall macroeconomic instability. Although the volume of capital flows to developing countries has increased substantially, their volatility has received very meagre attention in the literature (Demir, 2009).

1.2 Research problem

The first objective of this study is to investigate the determinants of private capital flow volatility in sub-Saharan Africa. A different line of inquiry concerning the effects of financial globalization pertains to the view that not all capital flow types are created equal (Kose, Prasad, Rogoff, & Wei, 2009). Because of the heterogeneous nature of capital flows, to lump them

together to examine their impact may not be sensible (Aizenman et al., 2013). The different private capital flow volatility determinants examined regarding this objective are FDI, portfolio equity, and cross-border banking lending.

The empirical literature typically distinguishes between two types of determinants of capital flows: push- and pull factors (Sarno, Tsiakas, & Ulloa, 2016). While most of these contributions investigate the determinants of the level of capital flows, few studies focus on the determinants of volatility (Broto, Diaz-Cassou, & Erce, 2011). Studies that have examined the determinants of private capital flow volatility include those of Neumann, Penl, and Tanku (2009), Broto et al. (2011), Mercado and Park (2011), and Lee, Park, and Byun (2013). However, no study has focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility.

Additional objectives of this study are to investigate some of the economic consequences of private capital flow volatility and financial openness in sub-Saharan Africa.

This study next explores the gap in the literature regarding the link between remittance volatility and financial development for sub-Saharan African countries at a macroeconomic level. This study distinguishes between the effect of remittance volatility on financial sector depth and financial sector efficiency. While other African studies within the remittances-financial development nexus focused on financial depth (see Gupta, Patillo, & Wagh, 2009; Ajilore & Ikhide, 2012), this study is extended to include financial sector efficiency. This study further contributes to the literature by not only focusing on the financial development of banks but also investigating the impact of remittance volatility on stock markets.

As opposed to other private capital flows, cross-border banking has only recently attracted attention in the empirical literature. An important and yet hardly explored area is the impact of cross-border banking volatility on economic growth. Sander, Kleimeier, and Heuchemer (2013) state that an emerging consensus in the literature proposes that cross-border banking analysis must focus on gross as opposed to net stocks and flows, therefore it is important to differentiate between assets (loans) and liabilities (deposits). This study explores the gap in the literature regarding the link between cross-border banking volatility (loans and deposits) and economic growth for sub-Saharan African countries at a macroeconomic level.

A potential cost of financial openness is output volatility. The sparse literature on the effects of financial openness on output volatility warrants more empirical research (Kose et al., 2009).

Also, there is still no consensus in the theoretical and empirical literature on whether financial openness increases or reduces output volatility (Hwang et al., 2013; Meller, 2013).

1.3 The gap in the literature

Apart from no prior study that has focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility, this study is further distinctive in that clearly-delineated cross-border bank lending data from the Bank for International Settlements' (BIS) Locational Banking Statistics were employed that has not been used by prior studies. Prior empirical studies that analysed disaggregated flows (e.g. Neumann et al., 2009; Broto et al., 2011; Mercado & Park, 2011) have used balance of payments data from the IMF's International Financial Statistics that incorporated a residual category, "other investment," including cross-border bank lending as a subcomponent. Other forms of cross-border finance (e.g. trade finance and cash) are however also included in this category that fundamentally differs from bank loans (World Bank, 2014).

While most of the empirical literature has found a positive relationship between remittances and financial development at a macroeconomic level, evidence remains mixed. Prior studies generally investigate only one characteristic of financial development (financial depth) for financial institutions. The impact of remittances on stock market development and financial sector efficiency has received little attention and is also included in this study. No prior empirical study has investigated the impact of remittance volatility on financial development at a macroeconomic level. For objective two, this study explores the gap in the literature regarding the link between remittance volatility and financial development (financial depth and financial efficiency) for banks and stock markets for sub-Saharan African countries at a macroeconomic level.

Mixed evidence is found regarding the influence of cross-border bank lending on economic growth while little empirical studies have investigated the impact of cross-border bank lending volatility on economic growth. In addition, there is an absence of studies that have captured the influence of bank deposit flows on economic growth. For objective three, this study explores the gap in the literature regarding the link between cross-border banking volatility (loans and deposits) and economic growth for sub-Saharan African countries at a macroeconomic level.

While previous sub-Saharan African studies have examined the financial openness and output volatility link, this study is unique in that it specifically investigates how financial openness impacts on output volatility through the channel of volatile FDI flows.

Capital flow volatility and output volatility could exhibit cross-section dependence through regional and macroeconomic linkages that arise from common global shocks (e.g. global financial crisis), shared institutions (e.g. the IMF), or from country or regional local spill overs. Standard panel estimation techniques do not necessarily produce consistent parameter estimates when the errors from a panel regression exhibit cross-section dependence (Kapetanios, Pesaran, & Yamagata, 2011). No prior empirical studies have accounted for this interdependence across countries in their methodology when investigating the determinants of capital flow volatility, or when examining the link between financial openness and output volatility. Previous studies that have investigated the determinants of capital flow volatility have primarily used estimators developed for micro datasets to analyse macro panel data. For objectives one and four, this study fills the gap in the econometric technique used in previous studies by estimating models using the Augmented Mean Group (AMG) estimator of Eberhardt and Teal (2010) to account for cross-section dependence and non-stationarity.

1.4 Research questions

- What are the determinants of private capital flow volatility in sub-Saharan Africa?
- Is there a relationship between remittance volatility and financial sector development in sub-Saharan Africa?
- Is there a relationship between cross-border banking volatility (loans and deposits) and economic growth in sub-Saharan Africa?
- Is there a relationship between financial openness and output volatility in sub-Saharan Africa?

1.5 Research objectives

- Investigate the determinants of private capital flow volatility in sub-Saharan Africa.
- Determine if there is a relationship between remittance volatility and financial sector development in sub-Saharan Africa.
- Determine if there is a relationship between cross-border banking volatility and economic growth in sub-Saharan Africa.
- Determine if there is a relationship between financial openness and output volatility in sub-Saharan Africa.

1.6 Research hypotheses

The following research hypotheses are provided for research questions/objectives 2-4:

- H_0 : Remittance volatility does not have a significant and negative impact on financial sector development in sub-Saharan Africa.
 H_A : Remittance volatility has a significant and negative impact on financial sector development in sub-Saharan Africa.
- H_0 : Cross-border banking volatility does not have a significant and negative impact on economic growth in sub-Saharan Africa.
 H_A : Cross-border banking volatility has a significant and negative impact on economic growth in sub-Saharan Africa.
- H_0 : Financial openness does not have a significant and negative impact on output volatility in sub-Saharan Africa.
 H_A : Financial openness has a significant and negative impact on output volatility in sub-Saharan Africa.

1.7 Significance of the study

Managing the volatility of private capital flows to developing countries has become a challenge for flows are more volatile than those in developed countries (Broner & Rigobon, 2004; Broto et al., 2011). Given that private capital flows to developing countries can be a major source of economic financing, policies that aim to encourage stable flows are particularly relevant (Broto et al., 2011). Many sub-Saharan African fragile economies are characterised by a low resilience and capacity to cope with shocks (Allen & Giovannetti, 2011) and, therefore, it becomes important to examine the determinants of private capital flow volatility in the region.

A better understanding of the consequences of remittance-receiving patterns – not only remittance levels – on the receiving economies will become more important in future years considering that the percentage of individuals living in countries other than those of their birth are rising (Amuedo-Dorantes & Pozo, 2012). For policies to leverage the most out of remittance inflows to developing countries it is essential that the predictability of remittances be given full attention (Amuedo-Dorantes & Pozo, 2014). With remittance levels complementing financial sector development in sub-Saharan Africa (Gupta et al., 2009), it also becomes necessary to investigate whether remittance volatility has an impact on financial sector development in the region.

With the presence of foreign banks having increased considerably in recent decades, it becomes necessary to examine whether there is a link between cross-border banking volatility and economic growth in sub-Saharan Africa. This is important as the negative effects of cross-border banking volatility could explain the region's poor economic performance relative to increased cross-border banking flows.

Financial liberalization policies have not had the desired impact on sub-Saharan African economies (Fowowe, 2013) and output volatility appears endemic in much of the region (Malik & Temple, 2009). For macroeconomic policies to successfully stabilize growth volatility it is essential to discern whether financial openness is a source of such volatility.

1.8 Chapter organization

The thesis is organized around four main themes similar to the research questions and objectives. Each theme has been developed into a stand-alone essay. In terms of chapters, the thesis consists of seven chapters. The first chapter introduces the research by highlighting the research problem and the significance of the study.

The second chapter reviews the trends of private capital flows and private capital flow volatility in sub-Saharan Africa, providing a contextual stage for the empirical chapters to follow. The third chapter begins the empirical investigation by examining the determinants of private capital flow volatility. The fourth chapter assesses whether remittance volatility impacts on financial sector development. The fifth chapter explores the link between cross-border banking volatility and economic growth. The empirical analysis ends with Chapter Six which investigates whether financial openness leads to output volatility in the region. The thesis ends with Chapter Seven that concludes and provides policy recommendations and future research possibilities.

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CHAPTER TWO

OVERVIEW OF PRIVATE CAPITAL FLOWS AND PRIVATE CAPITAL FLOW VOLATILITY IN SUB-SAHARAN AFRICA

2.1 Introduction

This chapter reviews the trends of private capital flows and private capital flow volatility in sub-Saharan Africa. The different private capital flow types examined are FDI, portfolio equity, remittances, and cross-border banking (loans and deposits). The chapter sets a contextual stage for the empirical chapters to follow.

Private capital flow trends in sub-Saharan Africa are different to other emerging and developing economies. For instance, portfolio flows remain small compared with flows to other emerging and developing economies (IMF, 2014) while the region is also the least recipient of remittances in terms of actual volume and per capita (Adenutsi, 2014). Capital flow volatility could overwhelm the relative shallow financial markets of sub-Saharan Africa (IMF, 2014) and countries within the region may require a different framework to manage vulnerabilities compared to other emerging and developing economies. The possible effect of capital flow volatility may be amplified because of the structure of sub-Saharan African economies. Very few sub-Saharan African countries have a positive net international investment position and countries that run a government deficit for years could potentially reach an unsustainable level (Hou, Keane, Kennan, Massa, & te Velde, 2013). When aid is not remaining at a high level, the productivity of capital inflows would need to be enhanced (Hou et al., 2013), thus further requiring countries to manage the vulnerabilities associated with capital flow volatility.

2.2 Private capital flow volatility

Measuring capital flow volatility is not simple and some studies have used the standard deviation of flows over a rolling window of annual data while others used the estimated volatilities of a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) (1,1) model (Broto, Diaz-Cassou, & Erce, 2011). Because of using low frequency (annual) data, using a GARCH (1,1) model is not considered suitable. To compute volatility, this study uses the measure most frequently employed in the literature: the standard deviation of capital flows in a rolling window, also employed by Neumann, Penl, and Tanku (2009), Mercado and Park (2011), and Lee, Park, and Byun (2013).

As in Broto et al. (2011) and Lee et al. (2013) the standard deviation of capital flows in a rolling window, σ_{it} , is expressed as follows:

$$\sigma_{it} = \left(\frac{1}{n} \sum_{k=t-(n-1)}^t (\text{flow}_{ik} - \mu)^2 \right)^{\frac{1}{2}} \quad (2.1)$$

where $\mu = \frac{1}{n} \sum_{k=t-(n-1)}^t \text{flow}_{ik}$, and flow_{ik} represents private capital flows relative to GDP respectively for country i in period k .

An increase in private capital flows would inflate the volatility size over time because the standard deviation indicates dispersion from the mean. Therefore, following Lee et al. (2013), this study first normalizes the capital flow size in a rolling window to account for sudden and inflated private capital flows since the 1990s. This is done by setting the largest flow in the window in absolute terms at 100 and adjusting the rest of the flows in the window accordingly. Three-year overlapping rolling windows are used as opposed to five-year rolling windows to minimize data loss in the portfolio equity series. In addition, data for cross-border banking is only available from 1996.

Although recent empirical research on capital flows has started focusing on disaggregated gross flows (e.g. Forbes & Warnock, 2012; Broner, Didier, Erce, & Schmukler, 2013) this study focuses on net flows while acknowledging that this focus reflects the joint behaviour of foreign and domestic agents. These different agents could have different motivations and incentives. This focus is largely driven by the availability of sub-Saharan Africa data. Figure 2.1 graphically depicts the calculated volatilities.

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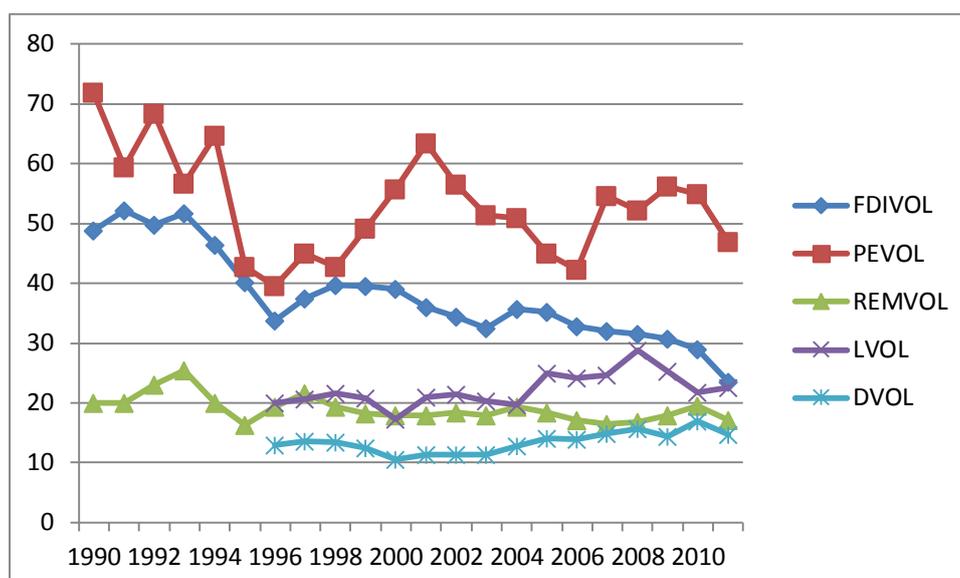


Figure 2.1: Volatilities of private capital flows to sub-Saharan Africa, 1990-2011

Source: Author's calculations using World Bank World Development Indicators (WDI) (2016) online database and Bank for International Settlements' (BIS) Locational Banking Statistics (2014)

Note: FDI volatility (FDIVOL); Portfolio equity volatility (PEVOL); Remittance volatility (REMVOL); Cross-border bank lending volatility (LVOL); and Cross-border bank deposit volatility (DVOL).

The scale of the vertical axis is the calculated volatilities computed as the standard deviation of capital flows in three-year overlapping rolling windows with capital flow sizes first normalized.

Portfolio equity has the highest average volatility at 51.6 followed by FDI volatility (37.7), cross-border bank lending volatility (22.2), remittance volatility (19.0), and cross-border bank deposit volatility (13.4). FDI is usually considered the most stable of private capital flows (Adams, 2009). Contrary to popular acceptance, FDI volatility has been higher on average than average cross-border banking (loans and deposits) volatility.

2.3 FDI

FDI is sought by many sub-Saharan African countries because of the large, positive externalities which are associated with these flows (Adjasi, Abor, Osei, & Nyavor-Foli, 2012). The related literature has revealed several benefits of FDI, including technology spill overs, global trade integration, better management techniques, forward and backward linkages, and

the enhancement of a more competitive business environment (Agbloyor, Abor, Adjasi, & Yawson, 2013).

Institutional quality in the form of political stability has been found to be a significant FDI determinant in Africa (Naudé & Krugell, 2007). However, FDI is also sensitive to global factors. While confirming that FDI inflows are negatively associated with political risk, Méon and Sekkat (2012) also found that FDI flows are less sensitive to political risk when the global volume of FDI is larger. An implication of this finding is that global risk-taking increases when global FDI activity increases. Therefore, not only FDI volumes but also FDI volatility would be affected by institutional quality (Méon & Sekkat, 2012). Allen and Giovannetti (2011) reported that in the second half of 2008 and the first half of 2009, a number of investment projects in sub-Saharan Africa were put on hold or cancelled. For example, the Democratic Republic of Congo and Zambia had mining projects cancelled while Sudan had a refinery postponed (Allen & Giovannetti, 2011).

FDI inflows to the region have surged tremendously since the 1990s. FDI to sub-Saharan Africa was estimated at US\$1.2 billion in 1990 while over US\$40 billion was estimated in 2011 (World Bank, 2016). Despite more countries being open to FDI, the levels on the African continent remain low compared to global trends (Agbloyor et al., 2013). Africa only attracted 5.5% of global FDI projects in 2011, up from 4.5% in 2010 (Ernst & Young, 2012). In 2011, Africa as a whole attracted fewer FDI projects than India and only about half as much as China. Africa has attracted 4.3% of global FDI projects since 2003 compared to 6% and 10.5% for India and China respectively. Nevertheless, an upward trend is apparent. Particularly from 2007, even allowing for the global financial crisis, compound growth of approximately 20% in the number of new FDI projects has been recorded. The reliance and growth attractiveness of the continent as an investment destination is thus clearly reflected (Ernst & Young, 2012).

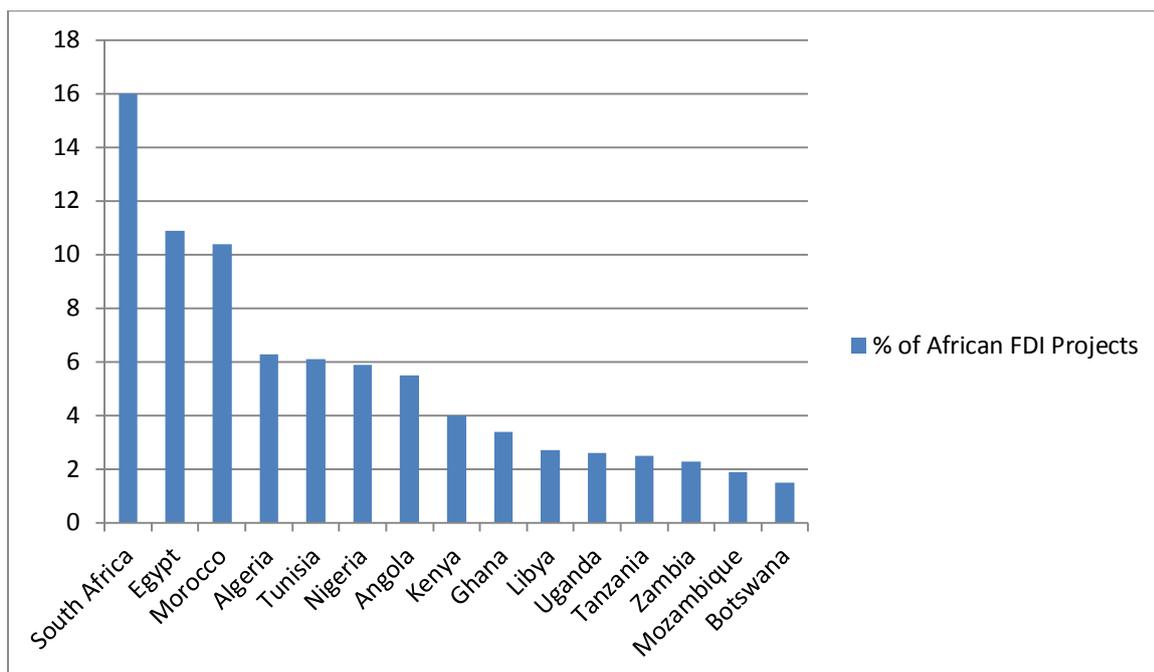


Figure 2.2: African countries' share of new African FDI projects from 2003-2011

Source: Ernst & Young (2012)

Figure 2.2 indicates the top 15 African countries that attracted 82% of new African FDI projects from 2003-2011. The 16% of new African FDI projects from 2003-2011 to South Africa shown in Figure 2.2 numbered 827 projects. It can be seen that after South Africa, the next sub-Saharan African countries are Nigeria and Angola with 5.9% and 5.5% of new African FDI projects respectively.

The sub-Saharan African countries with the highest calculated volatilities are the Democratic Republic of Congo (58.9), Angola (51.3), Gabon (50.3), Liberia (49.3), Burundi (49.2), and Cameroon (49.1). Noticeably, of the six highest FDI volatility countries, only Burundi is not classified as a resource-rich developing country (RRDC) following IMF (2012) criteria. Figure 2.3 graphically depicts the calculated FDI volatilities of RRDCs compared with a sub-Saharan African comparison group.

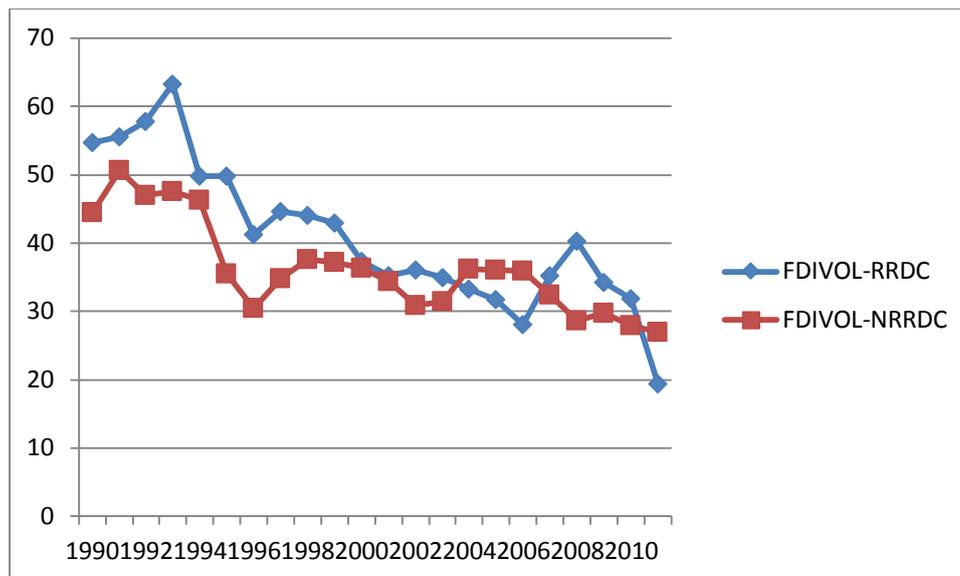


Figure 2.3: FDI volatility to RRDCs, 1990-2011

Source: Author's calculations using World Bank WDI (2016) online database

Note: FDI volatility (FDIVOL); Resource-rich developing country (RRDC); Comparison group (NRRDC).

The scale of the vertical axis is the calculated volatilities computed as the standard deviation of capital flows in three-year overlapping rolling windows with capital flow sizes first normalized.

From Figure 2.3 it can be seen that FDI volatility has on average been higher in RRDCs (41.0) than in the comparison group of countries (36.3). In 2007 and 2008, coinciding with the global financial crisis, FDI volatility increased in RRDCs while decreasing in the comparison group countries.

Figure 2.4 graphically depicts the calculated FDI volatilities of middle-income countries (MICs) and low-income countries (LICs) according to World Bank country income group classifications.

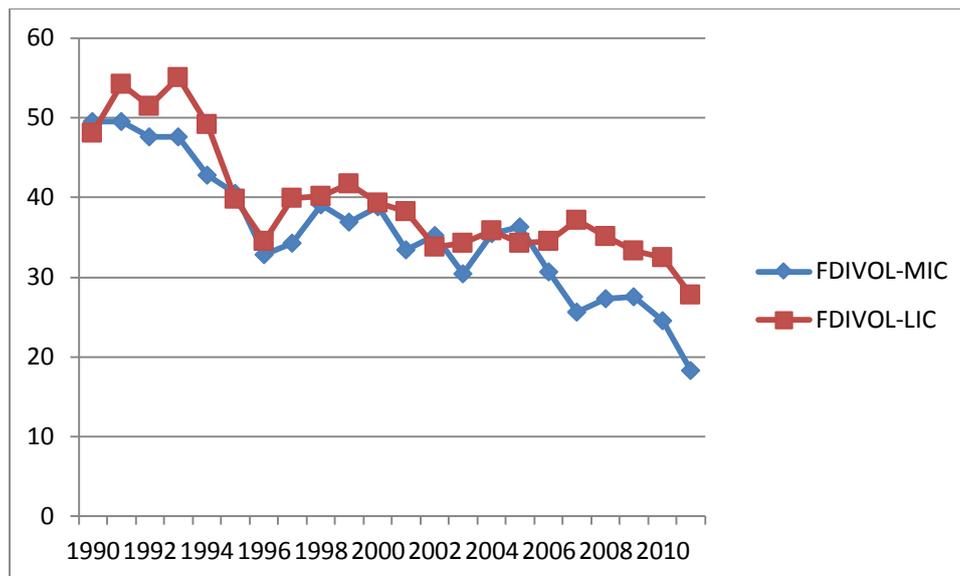


Figure 2.4: FDI volatility according to country income classification, 1990-2011

Source: Author's calculations using World Bank WDI (2016) online database

Note: FDI volatility (FDIVOL); middle-income countries (MIC); low-income countries (LIC).

The scale of the vertical axis is the calculated volatilities computed as the standard deviation of capital flows in three-year overlapping rolling windows with capital flow sizes first normalized.

Figure 2.4 shows that FDI volatility has on average been higher in LICs (39.6) than in MICs (35.7). FDI volatility in RRDCs and in LICs is therefore higher than the average FDI volatility (37.3) calculated for 45 sub-Saharan African countries.

2.4 Portfolio equity

Equity markets are becoming more important as a source of investment funds for developing countries (Hearn, Piesse, & Strange, 2010). Apart from supplying funds for investment, equity flows could impact on development by broadening the choice of financial instruments available to savers allowing for risk diversification and facilitating resource mobilisation. In addition, a monitoring role for the corporate sector is also provided by equity investment flows (Moss, Ramachandran, & Standley, 2007). Interest in African equity markets has been rising due to their fast growth and their relative low correlation with markets of the developed world (Alagidede, 2011).

Portfolio equity flows are generally considered one of the most volatile private capital flow types (Ferreira & Laux, 2009), as also confirmed in Figure 2.1 for sub-Saharan Africa. A surge in portfolio equity flows could lead to a real estate boom and inflation while a sudden stop can stunt growth, increase interest rates, and lead to currency depreciation (Sarno, Tsiakas, & Ulloa, 2016).

Table 2.1 presents stock market capitalization/GDP and average portfolio equity volatility for selected sub-Saharan African countries.

Table 2.1: Portfolio equity volatility to sub-Saharan African countries

Country	Stock exchange	Stock market capitalization to GDP (%), 2011	Average portfolio equity volatility
Botswana	Botswana Stock Exchange	25.3	68.3
Côte d'Ivoire	Bourse Régionale des Valeurs Mobilières	28.9	37.9
Kenya	Nairobi Stock Exchange	35.3	49.3
Malawi	Malawi Stock Exchange	22.9	46.5
Mauritius	Stock Exchange of Mauritius	69.8	45.8
Namibia	Namibia Stock Exchange	9.6	25.8
Nigeria	Nigerian Stock Exchange	17.3	58.1
South Africa	Johannesburg Stock Exchange	145.2	56.7
Tanzania	Dar es Salaam Stock Exchange	5.6	7.4
Uganda	Uganda Securities Exchange	26.2	80.9
Zambia	Lusaka Stock Exchange	17.7	54.8

Source: World Bank WDI (2016) online database and author's calculations

Note: Average portfolio equity volatility is calculated over different periods up to 2011 depending from when data is available.

Stock market depth, as measured by stock market capitalization to GDP, varies greatly in sub-Saharan Africa. For 2011, South Africa has the highest stock market capitalization to GDP at

145.2%, followed by Mauritius at 69.8%. Stock market capitalization to GDP has decreased in South Africa since 2007 from 265.6% while the ratio has increased in Mauritius from 59.2%.

Portfolio equity flows to sub-Saharan Africa have surged in recent decades. Inflows to the region were estimated at US\$393 million in 1990 with approximately US\$5 billion estimated in 2011 (World Bank, 2016). However, the volatile nature of these flows (and reversal of flows) is demonstrated in that approximately US\$17 billion portfolio equity inflows to sub-Saharan Africa were recorded in 2006 (World Bank, 2016). The reversal in portfolio equity inflows was consistent with the fall of stock markets during the global financial crisis. During 2008, the following selected country stock index declines occurred: Nigeria All Share Index (46%), Mauritius All Share Indices (36%), Nairobi Stock Exchange 20-Share Index (34%), and the Johannesburg Stock Exchange All Share Index (26%) (Hou et al., 2013).

The average volatility of portfolio equity flows to Nigeria and South Africa has been higher than the average volatility portfolio equity flows in the region.

2.5 Remittances

The drastic increase in remittances to developing countries during the last decades has led researchers to investigate the developmental impact of remittances in several dimensions (Coulibaly, 2015). Many studies have investigated the impact of remittances on poverty, inequality, growth, education, infant mortality, and entrepreneurship (Demirgüç-Kunt, Cordova, Martinez Peria, & Woodruff, 2011). Recently, attention has also focused on whether remittances promote financial development in remittance-recipient countries (see Aggarwal, Demirgüç-Kunt, & Martinez Peria, 2011; Brown, Carmignani, & Fayad, 2013).

Although altruism is cited as the primary motive for migrants to remit, repayment of loans as well as savings and investment considerations have also been demonstrated as important reasons in the literature (Chowdhury, 2011). The growing importance of remittances and their positive impact on recipient countries' economic conditions have created strong incentives for governments to facilitate and attract these flows (Beine, Lodigiani, & Vermeulen, 2012).

In the literature, remittances are often seen as a more stable source of external finance compared to other capital flows (Jackman, 2013). Migrants often transfer more money home when their families encounter economic hardship while adverse times also frequently trigger more migration resulting in greater remittance inflows (Singer, 2010). However, as the events of the global financial crisis unfolded, the countercyclical nature of remittance flows has been

questioned (Allen & Giovannetti, 2011). Adenutsi, Aziakpono, and Ocran (2012) found that remittances in sub-Saharan Africa are pro-cyclical and correlate positively with macroeconomic performance, while Nyamongo, Misati, Kipyegon, and Ndirangu (2012) found that remittance volatility has a negative effect on growth in Africa. Figure 2.5 depicts the time profile of remittances to 45 sub-Saharan African countries from 1990-2011.

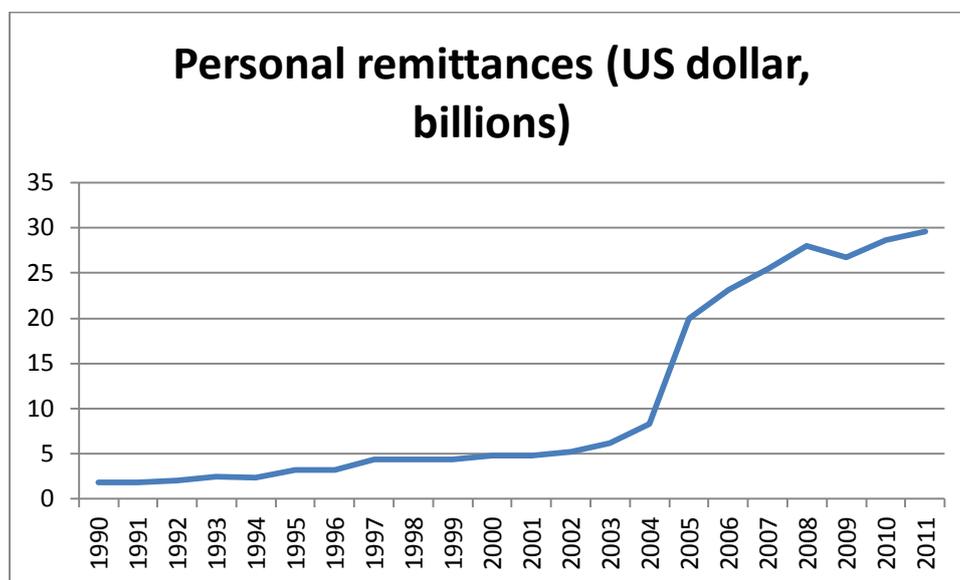


Figure 2.5: Remittances to sub-Saharan Africa, 1990-2011

Source: World Bank WDI (2016)

From figure 2.5 it can be seen that remittances to sub-Saharan Africa have increased from approximately US\$1.8 billion in 1990 to approximately US\$30 billion in 2011. Remittances are becoming a significant source of external capital for countries in the region. For a typical sub-Saharan African country, remittances have increased from 1.6% of GDP in 2006 (Gupta, Pattillo, & Wagh, 2009) to 4% of GDP in 2012 (Aga & Martinez Peria, 2014). In 2011, there were 8 sub-Saharan African countries where remittances as a share of GDP exceeded 5% (World Bank, 2016). Remittances as a percentage of GDP exceeded 20% in Lesotho and Liberia. In the largest recipient countries, i.e. Nigeria and Senegal, remittances to GDP were 5% and 11% respectively. Nigeria is by far the leading remittance recipient country in sub-Saharan Africa, with US\$20.6 billion recorded in 2011 representing almost 70% of all remittances to the region (World Bank, 2016).

From 1991-2011, average remittance volatility to the region has been the highest in Sierra Leone (34.8), Seychelles (34.3), and Guinea (34.2). The average remittance volatility in Nigeria (24.9) has been higher than the average volatility in the region (19.0).

2.6 Cross-border banking

Although interrupted by the global financial crisis, the past decades have witnessed an unprecedented increase in the globalization of financial services. Not only have cross-border bank flows increased considerably, but many banks (from developed and developing countries) have ventured abroad (Claessens & van Horen, 2014). Foreign banks can achieve better economies of scale and risk diversification than local banks (Detragiache, Tressel, & Gupta, 2008). In addition, foreign banks introduce more advanced technology, import better supervision and regulation, and increase competition. Foreign affiliates of international banks may be perceived as safer than local banks, especially in times of economic hardship. Foreign banks may also be less susceptible to lend to connected parties (Detragiache et al., 2008).

Together with portfolio equity flows, cross-border banking flows are also considered highly volatile (Herrmann & Mihaljek, 2013). However, as indicated in Figure 2.1, FDI volatility has on average been higher than cross-border banking volatility for sub-Saharan African countries. On average, cross-border lending volatility has been higher than cross-border bank deposit volatility, also shown in Figure 2.1. A plausible explanation for the difference could be that deposits are largely customer-driven and banks have little incentive to reject deposits, whereas information asymmetries may impact on the supply of cross-border bank loans (Kleimeier, Sander, & Heuchemer, 2013).

The presence of foreign banks in Africa has increased considerably in recent decades. From 1995 to 2009, cross-border bank branches or subsidiaries in Africa have increased from 120 to 227, resulting in the share of foreign banks rising from 29% to 51% (Beck, Fuchs, Singer, & Witte, 2014). However, there are differences across the continent regarding foreign bank ownership (Beck et al., 2014). Foreign banks almost completely dominate some smaller country banking sectors including Benin, Burkina Faso, Lesotho, Madagascar, Mozambique, and Zambia. In a number of countries foreign banks control between 60%–80% of total banking sector assets, including Botswana, Chad, Côte d'Ivoire, Guinea-Bissau, Mali, Mauritania, Namibia, Niger, and Senegal. Some countries with more developed banking sectors, i.e. Kenya, Nigeria, and South Africa, have a comparatively low share of foreign ownership in their banking systems, between 20%–35%. Foreign bank ownership in Africa can be grouped into two categories based on their geographical origin (Beck et al., 2014; UNCTAD, 2015):

- International banks from outside Africa, particularly Europe. However, there is an increasing presence of South-South banks from emerging economies such as India and China; and
- African cross-border banks incorporated predominantly in Kenya, Morocco, Nigeria, and South Africa.

Tables 2.2 and 2.3 provide a list of major International and African cross-border banks respectively.

Table 2.2: Major international cross-border banks in Africa

Name	Location of headquarters	Majority ownership	Number of African countries
Société Générale	France	France	17
Citigroup	USA	USA	15
Standard Chartered	UK	UK	14
BNP Paribas	France	France	13
Bank of Baroda	India	India	9
Access Holding	Germany	Unknown	5
Albaraka Bank (Group)	Bahrain	Bahrain	5
HBL Pakistan (Habib Bank Ltd.)	Pakistan	Tanzania	5
International Commercial Bank (ICB)	Switzerland	Malaysia	5
Rabobank	Netherlands	Netherlands	5

Source: Beck et al. (2014)

Note: Number of countries includes home country (if African) as well as representations through branches and subsidiaries in African countries. Representative offices are excluded.

Table 2.3: Major African cross-border banks

Name	Location of headquarters	Majority ownership	Number of African countries
Ecobank	Togo	South Africa	32
UBA	Nigeria	Nigeria	19
Stanbic	South Africa	South Africa	18
BMCE	Morocco	Morocco	18
BSIC	Libya	Libya	14
Attijariwafa Bank	Morocco	Morocco	12
BCP	Morocco	Morocco	11
Barclays Africa Group	South Africa	UK	10
Access Bank	Nigeria	Nigeria	9
Guaranty Trust Bank Ltd.	Nigeria	Nigeria	9

Source: Beck et al. (2014)

Note: Number of countries includes home country (if African) as well as representations through branches and subsidiaries in African countries. Representative offices are excluded.

Cross-border bank lending in sub-Saharan Africa has increased from US\$45.2 billion in 1995 to US\$92.7 billion in 2011, while cross-border bank deposits have increased from US\$43.3 billion in 1995 to a high of US\$156.7 billion in 2007 (BIS, 2014). During the global financial crisis, cross-border bank deposits decreased to US\$135.6 billion and US\$126.4 billion respectively in 2008 and 2009 before increasing to US\$150.5 billion in 2011 (BIS, 2014). In 2012, the highest cross-border bank lending flows were recorded in South Africa (US\$26.83 billion) and Liberia (US\$26.08 billion), while the highest cross-border bank deposit flows were recorded in South Africa (US\$30.41 billion), Nigeria (US\$26.63 billion), and Angola (US\$26.15 billion).

From 1996-2011, average cross-border bank lending volatility to the region has been highest in Comoros (38.9), Burundi (38.7), and Rwanda (38.7). Average cross-border bank deposit volatility was highest in Lesotho (35.3), and Swaziland (31.8).

2.7 Conclusion

This chapter provided a contextual stage for the empirical chapters to follow. The measure used to compute volatility was discussed and presented. This chapter has highlighted some stylized facts and current trends regarding private capital flows and private capital flow volatility in sub-Saharan Africa. The different private capital flow types and their volatility examined were FDI, portfolio equity, remittances, and cross-border banking flows (loans and deposits). The chapter showed that all private capital flow types have increased considerably since the 1990s. The role of private capital flows and how best to attract and utilise them remain crucial for sub-Saharan Africa and the chapter discussed the importance of the different capital flow types for economic development. It was found that portfolio equity has the highest average volatility over the period covered, while cross-border bank deposit flows are the most stable. The empirical chapters to follow will investigate the determinants and economic consequences of private capital flow volatility in sub-Saharan Africa.

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CHAPTER THREE

THE DETERMINANTS OF PRIVATE CAPITAL FLOW VOLATILITY IN SUB-SAHARAN AFRICA

3.1 Introduction

Concerns have risen regarding the stability of capital flows to developing economies. It has been argued that global capital flows could have a destabilizing role in developing economies in particular when a financial crisis causes a sudden reversal of such flows (Neumann, Penl, & Tanku, 2009). The last decade witnessed an increase in capital flow volatility that could have numerous economic consequences (Forbes & Warnock, 2012). These consequences could include economic cycles being amplified by large capital flow increases and decreases, increased financial system vulnerabilities, and exacerbated macroeconomic instability. Capital inflow surges could overwhelm domestic financial markets and hamper the ability of macroeconomic policies' ability to adjust through exchange rate appreciation, asset price bubbles, money market distortions, and credit booms and create unsustainable risk premium drops (IMF, 2012).

Most empirical studies on capital flows focus on the determinants of capital flow levels with few studies on volatility, which is surprising given the link between the stability of capital flows and economic growth (Broto, Diaz-Cassou, & Erce, 2011). Demir (2009) states that although the volume of capital flows to developing countries increased substantially from the 1990s, their volatility has received very meagre attention in the literature. No study has focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility. The aim of this study is to investigate the impact of global and domestic factors on the determinants of the volatility of foreign direct investment (FDI), portfolio equity and cross-border bank lending inflows for sub-Saharan African countries.

A novel feature of this study is the use of clearly-delineated cross-border bank lending data from the Bank for International Settlements' (BIS) Locational Banking Statistics. Prior empirical studies that analysed disaggregated flows (e.g. Neumann et al., 2009; Broto et al., 2011; Mercado & Park, 2011) have used balance of payments data from the IMF's International Financial Statistics that incorporated a residual category, "other investment," including cross-border bank lending as a subcomponent. Other forms of cross-border finance (e.g. trade finance

and cash) are however also included in this category that fundamentally differs from bank loans (World Bank, 2014).

Recent advances in the panel data literature allows the estimation of models subject to cross-section dependence previously ignored by similar panel data studies in the related literature. Capital flow volatility could exhibit cross-section dependence through regional and macroeconomic linkages that arise from common global shocks (e.g. global financial crisis), shared institutions (e.g. the IMF), or from country or regional local spill overs. Standard panel estimation techniques do not necessarily produce consistent parameter estimates when the errors from a panel regression exhibit cross-section dependence (Kapetanios, Pesaran, & Yamagata, 2011). The models in this study are estimated using the Augmented Mean Group (AMG) estimator of Eberhardt and Teal (2010) to account for cross-section dependence.

The rest of this chapter is structured as follows: Section 3.2 provides an overview of the relevant literature, Section 3.3 details the methodology employed in the empirical analysis, in Section 3.4 the results from the empirical estimations are presented and in Section 3.5 the chapter is concluded.

3.2 Overview of the relevant literature

Bekaert and Harvey (2003) stated that prior to financial liberalization, emerging market economies start with negligible capital flows while encountering considerable flows post-liberalization that are subject to portfolio rebalancing. It should therefore not be surprising that capital flow volatility increases close to liberalization, but once large capital flows occur should subside.

Aghion, Bacchetta, and Banerjee (2004) introduced a framework to analyse how financial factors could lead to instability in small open economies. In an economy with a closed capital market, the response to a cash flow shock is limited given the constrained amount of capital available to finance entrepreneurs. The extra funding sources in an open economy could potentially increase the response to a shock and the potential for volatility. Aghion et al. (2004) concluded that unrestricted financial liberalization could be destabilizing without a sufficiently well-developed financial sector.

A major subject in volatility of capital flows is the distinction between push and pull factors (Forbes & Warnock, 2012). Push factors reflect global economic forces that drive capital flows from developed to developing countries and could relate to global interest rates, global growth,

and global risk aversion and portfolio diversification (Sarno, Tsiakas, & Ulloa, 2016). Pull factors reflect domestic economic forces that attract capital into a country and capture the appeal of different locations for investment purposes and could relate to domestic interest rates, local growth potential and trade openness (Sarno et al., 2016). Tille and van Wincoop (2014) demonstrate how private information leads to increased capital flow volatility using a two-country Dynamic Stochastic General Equilibrium (DSGE) model through unobserved push and pull factors. Several channels exist through which the unobserved factors impact capital flows. In the portfolio growth channel that is dependent on savings, unobserved pull factors impact capital flows through the relative asset price. An increase in these factors raise the relative home asset price, thereby lowering home saving and raising foreign saving, and through portfolio growth higher capital inflows occur.

Through the average expected excess return channel, unobserved pull factors impact capital flows through the relative asset price. An increase in these factors raises the relative asset price that lowers relative home saving and increases relative home investment, with both causing an excess home asset supply. The expected excess home asset return will then rise to clear asset markets by a portfolio shift to home assets with capital inflows rising (Tille & van Wincoop, 2014). In their model, a trade-off exists between home bias because of the cost of investing abroad and seeking risk reduction through diversification. Through the time-varying risk channel, an increase in the variance of the excess return will raise the portfolio diversification scope and increase capital inflows. The variance of the excess return only depends on push factors in all versions of the model (Tille & van Wincoop, 2014).

In the empirical literature, Broner and Rigobon (2004) showed that capital flows to developing economies were much more volatile than those to developed economies and that macroeconomic controls offered little explanatory power to explain this. However, country characteristics such as quality of institutions, a high per capita income, and financial development were associated with lower volatility.

Alfaro, Kalemli-Ozcan, and Volosovych (2007) suggest that the quality of institutions, as well as macroeconomic policy, were important determinants of capital flow volatility. IMF (2007) also found that institutional quality reduced capital inflow volatility. Other findings indicated that financial openness lowers capital flow volatility and that the volatility of capital inflows was partly driven by external factors such as global liquidity and hence outside the control of emerging economies. Alfaro et al. (2007) examined the volatility of portfolio equity flows

while IMF (2007) analysed the volatility of total inflows. Contrasting data on six industrial and six developing countries, the findings of Becker and Noon (2009) suggest that more developed markets could encourage greater substitutability between different types of capital flows that could help reduce overall capital account volatility.

Using panel data from 1981-2000, Neumann et al. (2009) investigated the volatility of FDI inflows, portfolio inflows and other debt inflows following financial liberalization for a set of 22 developing and developed economies. Their findings showed that different capital flow types responded differently to financial liberalization, with FDI inflows showing significant increases in volatility for emerging markets. Broto et al. (2011) examined the determinants of volatility of FDI inflows, portfolio inflows and other debt inflows to emerging economies with their findings highlighting the difficulties host governments faced in stabilizing capital flows. Specifically, since 2000 global factors not within the control of developing economies became increasingly significant. Mercado and Park (2011) used a panel GMM estimator on data from 1980-2009 to examine the determinants of volatility of FDI inflows, portfolio inflows and other debt inflows to developing Asia. Their results suggested that institutional quality and pull factors such as trade openness, financial openness, and change in stock market capitalization were significant factors impacting on capital inflow volatility.

The results from Pappas (2011) for Greece during the period 1983-2009 revealed that capital flows and speculative attacks were strongly determined by external economic factors. Forbes and Warnock (2012) used quarterly gross flows data in a sample of 58 countries from 1985-2009 and found that global factors were significantly associated with extreme capital flow episodes with domestic macroeconomic characteristics generally less important. Similarly, the results from Globan (2015) suggested the rising influence of push factors were connected with higher capital inflow volatility in the European Union new member states.

Using a GMM estimator for 49 emerging and developing economies from 1990-2009, Lee, Park, and Byun (2013) found significant contagion effects from intra-regional volatilities in different private capital flow types to emerging economies. Their findings further suggested that the volatility dynamics differ between gross and net flows. Broner, Didier, Erce, and Schmukler (2013) used a sample of 103 countries from 1970-2009 and demonstrated with panel estimation techniques the increasing size and volatility of gross capital flows. In comparison, the size and volatility of net flows remained stable.

To summarize, within the empirical literature no study has focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility. Most of the studies that have focused on disaggregated capital inflows have used balance of payments data obtained from the IMF's International Financial Statistics to analyse FDI, portfolio and other flows.

3.3 Methodology

3.3.1 Data on capital flows

Recent empirical research on capital flows has started examining the behaviour of gross capital flows (e.g. Forbes & Warnock, 2012; Broner et al., 2013) that distinguishes between the behaviour of foreign and domestic agents that could have different motivations and incentives. The earlier focus in the literature on net flows is reasonable as during the 1990s net capital inflows almost mirrored gross inflows, implying that the capital outflows of domestic investors could be ignored with net inflows then interpreted as changes from foreign flows (Forbes & Warnock, 2012). For sub-Saharan Africa data on gross flows is still limited and, similar to Neumann et al. (2009) and Broto et al. (2011), this study's focus is on capital inflows and the reversal of such flows and interpreted as the net inflows from foreign investors.

3.3.2 Model specification

Following the models adapted from Broto et al. (2011) and Mercado and Park (2011) the empirical model is specified as:

$$\begin{aligned} \text{VOL}_{it} = & \beta_0 + \beta_1 \text{GLLIQ}_t + \beta_2 \text{VIX}_t + \beta_3 \log \text{GDP}_{it} + \beta_4 \text{EXCH}_{it} \\ & + \beta_5 \text{TO}_{it} + \beta_6 \text{FO}_{it} + \beta_8 \text{PVTC}_{it} + \varepsilon_{it} \end{aligned} \quad (3.1)$$

This model is estimated three times for the three different private capital flows, i.e. FDI, portfolio equity, and cross-border bank lending, with the variables defined as follows:

VOL_{it} = Volatility of private capital flows measured as the standard deviation of capital inflows in three-year overlapping rolling windows of FDI inflows/GDP or Portfolio equity inflows/GDP or Cross-border bank lending/GDP of country i at year t .

GLLIQ_t = Global liquidity at year t .

VIX_t = VIX index as a proxy for global risk at year t .

$\log \text{GDP}_{it}$ = GDP (constant 2005 US\$) of country i at year t .

$EXCH_{it}$ = Official exchange rate of country i at year t .

TO_{it} = Trade openness of country i at year t .

FO_{it} = Financial openness of country i at year t .

$PVTC_{it}$ = Private credit by deposit money bank other financial institutions/GDP of country i at year t .

Measuring capital flow volatility is not simple and some studies have used the standard deviation of flows over a rolling window of annual data with others using the estimated volatilities of a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) (1,1) model (Broto et al., 2011). To compute volatility, this study uses the measure most frequently employed in the literature: the standard deviation of capital flows in a rolling window, also employed by Neumann et al. (2009), Mercado and Park (2011), and Lee et al. (2013). As in Broto et al. (2011) and Lee et al. (2013) the standard deviation of capital flows in a rolling window, σ_{it} , is expressed as follows:

$$\sigma_{it} = \left(\frac{1}{n} \sum_{k=t-(n-1)}^t (\text{flow}_{ik} - \mu)^2 \right)^{\frac{1}{2}} \quad (3.2)$$

where $\mu = \frac{1}{n} \sum_{k=t-(n-1)}^t \text{flow}_{ik}$, and flow_{ik} represents capital inflows relative to GDP for country i in period k . The capital inflows refer to FDI, portfolio equity, and cross-border bank lending.

Following Lee et al. (2013) the study first normalises the capital flow size in a rolling window to account for sudden and inflated private capital flows since the 1990s. This is done by setting the largest flow in the window in absolute terms at 100 and adjusting the rest of the flows in the window accordingly. Three-year overlapping rolling windows are used as oppose to five-year rolling windows to minimize data loss in the portfolio equity series.

A further description of the variables and their data sources appear in Appendix 3.A.

The theoretical underpinning of the model (equation 3.1) are based on two principles; the Global Factors (Push Determinants) of capital flow volatility and the Domestic Factors (Pull Determinants) of capital flow volatility. In the case of Global Factors (Push Determinants), this study uses global liquidity and global risk to capture Global Factors following Broto et al.

(2011) and Forbes and Warnock (2012). Broto et al. (2011) stated that for push determinants the relationship with capital flow volatility could be ambiguous. Stronger global real side conditions could render financial assets in advanced economies more attractive and subsequently reduce inflows to developing economies (World Bank, 2014). However, a decrease in global liquidity could also spark a flight to quality (Broto et al., 2011). The empirical findings of IMF (2007) and Mercado and Park (2011) revealed that an increase in global liquidity decreases capital inflow volatility. Similarly, this study expects a negative relationship between global liquidity and volatility a priori. However, greater uncertainty and risk aversion is likely to be associated with weaker capital flows (World Bank, 2014) and a positive association between global risk and volatility is expected a priori.

In the case of Domestic Macroeconomic Factors (Pull Determinants), this study uses GDP growth, exchange rate, trade openness, and financial openness to capture Domestic Macroeconomic Factors. According to Lee et al. (2013) a negative relationship is expected between GDP growth rate and capital inflow volatility, with the former regarded as a proxy for the dynamism of the host economy. This study, therefore, expects a negative relationship. The exchange rate is this study's proxy for the quality of macroeconomic policies and a positive relationship with volatility is expected as capital inflows could be more volatile where erratic monetary conditions prevail. Martin and Rey (2006) analysed the effects of trade globalization on the likelihood of financial crashes in emerging economies and found that trade globalization decreases the chances of crashes. However, trade could be associated with higher capital inflow volatility in countries that rely on international trade. Countries that have a narrow export base could be more at risk when global conditions change (Broto et al., 2011). Mercado and Park (2011) found that trade openness increased the volatility of all capital flow types in developing Asia. This study also expected a positive relationship between trade openness volatility a priori.

The findings of Neumann et al. (2009), Mercado and Park (2011) and Lee et al. (2013) reveal that the impact of financial openness on capital inflow volatility is not uniform across the different types of capital inflows. Mercado and Park (2011) found that financial openness increased the volatility of FDI inflows while decreasing that of foreign portfolio investment flows. As emerging markets ease capital movements, flows may become subject to sudden surges, stops or reversals. The a priori expectation for the expected coefficient for financial openness can, therefore, be either positive or negative.

As opposed to the studies of Mercado and Park (2011) and Lee et al. (2013) that used the popular Chinn-Ito (2008) Financial Openness Index as a de jure indicator of financial openness, this study employed a de facto financial openness indicator using the “External Wealth of Nations Mark II” database of Lane and Milesi-Ferretti (2007) that measures the stocks of foreign assets and liabilities. The choice of financial openness indicator centres on the relative time-invariant character of the Chinn-Ito (2008) Index over the chosen time frame. This study also concerns the volatility dynamics of private capital flows actually happening and thus a de facto measure of financial openness is preferred.

In the case of Domestic Financial Factors (Pull Determinants), this study uses private credit to capture a Domestic Financial Factor. Broto et al. (2011) stated that higher levels of private credit could indicate a more developed banking system associated with lower volatility. Conversely higher levels of private credit signify economic overheating leading to capital inflow volatility. The a priori expectation for the expected coefficient for private credit can, therefore, be either positive or negative.

3.3.3 Estimation technique

Panel regressions are estimated using macro-level data for sub-Saharan African countries from 1990 to 2011 for the FDI and portfolio equity volatility samples. For the cross-border bank lending volatility sample, the study used data from 1996 to 2011 reflecting data availability from the BIS Locational Banking Statistics. There are 39 countries in the FDI volatility sample, 9 countries in the portfolio equity sample, and 33 countries in the cross-border bank lending volatility sample. Countries appear in Appendix 3.B.

Given the nature of the panel, large N and large T, the study tests for cross-section dependence as well as unit roots. Pesaran’s (2004) cross-section dependence test (CD) and Pesaran’s (2007) cross-sectional augmented panel unit root test (CIPS) ($Z(t\text{-bar})$) test for unit roots, since it also caters for cross-section dependence, were employed. The CIPS tests were estimated with a constant term and trend while the Im, Pesaran, and Shin (2003) (IPS) panel unit root test was first run on each series using an Akaike Information Criterion (AIC) automatic lag selection process in order to identify the number of lags to be used for the CIPS tests. Tables 3.1-3.3 report the tests for cross-section dependence and unit roots for the three different capital flow volatility samples.

Table 3.1: Tests for cross-section dependence and unit roots: FDI volatility sample

Variable	CD-test	p-value	Corr	Abs(corr)	CIPS	p-value
FDI volatility	22.10	0.000	0.151	0.307	-3.163	0.001
Global liquidity	147.58	0.000	1.000	1.000	28.925	1.000
Global risk	147.58	0.000	1.000	1.000	28.925	1.000
Log GDP	112.87	0.000	0.839	0.839	2.109	0.983
Exchange rate	95.48	0.000	0.653	0.653	1.084	0.861
Trade openness	20.76	0.000	0.142	0.357	1.746	0.960
Financial openness	23.94	0.000	0.426	0.426	2.825	0.998
Private credit	n/a [#]	n/a [#]	n/a [#]	n/a [#]	-1.152	0.125

Note: # indicates that the panel is unbalanced with not enough common observations across the panel to perform Pesaran's (2004) test.

Table 3.2: Tests for cross-section dependence and unit roots: Portfolio equity volatility sample

Variable	CD-test	p-value	Corr	Abs(corr)	CIPS	p-value
Portfolio equity volatility	2.18	0.029	0.080	0.256	-1.699	0.045
Global liquidity	31.46	0.000	1.000	1.000	13.635	1.000
Global risk	31.46	0.000	1.000	1.000	13.635	1.000
Log GDP	29.72	0.000	0.945	0.945	1.849	0.968
Exchange rate	24.35	0.000	0.774	0.774	-1.413	0.079
Trade openness	3.29	0.001	0.105	0.326	0.711	0.726
Financial openness	2.08	0.037	0.066	0.437	2.064	0.980
Private credit	4.04	0.000	0.139	0.405	-0.582	0.280

Table 3.3: Tests for cross-section dependence and unit roots: Cross-border bank lending volatility sample

Variable	CD-test	p-value	Corr	Abs(corr)	CIPS	p-value
Bank lending volatility	0.79	0.431	0.007	0.261	-3.589	0.000
Global liquidity	117.37	0.000	1.000	1.000	25.602	1.000
Global risk	117.37	0.000	1.000	1.000	25.602	1.000
Log GDP	97.65	0.000	0.832	0.913	1.548	0.939
Exchange rate	33.29	0.000	0.285	0.600	1.988	0.977
Trade openness	15.27	0.000	0.131	0.449	1.693	0.955
Financial openness	28.03	0.000	0.239	0.544	0.063	0.525
Private credit	n/a [#]	n/a [#]	n/a [#]	n/a [#]	1.085	0.861

Note: # indicates that the panel is unbalanced with not enough common observations across the panel to perform Pesaran's (2004) test.

From Table 3.1 (the FDI volatility sample) it can be seen that seven out of eight variables exhibit cross-section dependence. Credit to the private sector could not be tested due to numerous gaps in the series. Only FDI volatility was found to be stationary at levels with the rest of the variables containing unit roots. Table 3.2 (the portfolio equity volatility sample) shows that all the variables exhibit cross-section dependence. Two out of eight variables, portfolio equity volatility and exchange rate, were found to be stationary at levels with the rest of the variables containing unit roots. In Table 3.3 (the cross-border bank lending volatility sample) six out of eight variables exhibit cross-section dependence while credit to the private sector again could not be tested. Only cross-border bank lending volatility was found to be stationary at levels, with the rest of the variables each containing a unit root. Clearly there is a need to account for the cross-section dependence and non-stationarity in the panel.

The recent non-stationary panel literature has focused on allowing general cross-section dependencies among panel members (Pedroni, Vogelsang, Wagner, & Westerlund, 2015). To account for this, the study estimates models using the AMG estimator of Eberhardt and Teal (2010), a technique that caters for residual cross-section dependence as well as non-stationary residuals. Standard panel estimation techniques (such as pooled OLS, fixed or random effects,

or GMM) do not necessarily produce consistent parameter estimates when the errors from a panel regression exhibit cross-section dependence (Kapetanios et al., 2011).

3.4 Results and discussion

3.4.1 Summary and descriptive statistics

Table 3.4 provides descriptive statistics of the different private capital flow variables as well as the calculated volatility measures from 1990 to 2011. For the cross-border bank lending sample, the table reports data from 1996 when the BIS Locational Statistics' data became available.

Table 3.4: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
fdi	967	3.787029	8.410295	-82.8921	91.00733
pe	300	.0080147	.0714518	-.0164958	.9993084
cb	669	.989707	7.373167	-.2548578	137.4378
fdivol	962	37.66592	20.00908	1.60489	110.8398
pevol	272	51.59815	24.13482	.8234217	106.375
cbvol	668	22.14833	16.06479	.3684528	105.0894

Source: World Bank WDI online (2016) database and BIS Locational Banking Statistics (2014)

Note: FDI (fdi); portfolio equity (pe); cross-border bank lending (cb); FDI volatility (fdivol); portfolio equity volatility (pevol); cross-border bank lending volatility (cbvol).

The descriptive statistics report that net FDI inflows to GDP has an average mean of 3.787, much higher than the net portfolio equity to GDP (0.008) and cross-border bank lending to GDP (0.990) average means. FDI is considered a more stable private capital flow since large, fixed and illiquid assets would be difficult to disinvest rapidly from compared to portfolio- and debt flows (Agbloyor, Abor, Adjasi, & Yawson, 2013). FDI volatility (37.67) on average has been higher than cross-border bank lending volatility (22.15). Portfolio equity has the highest recorded volatility at 51.60. Figure 3.1 graphically depicts the calculated volatilities.

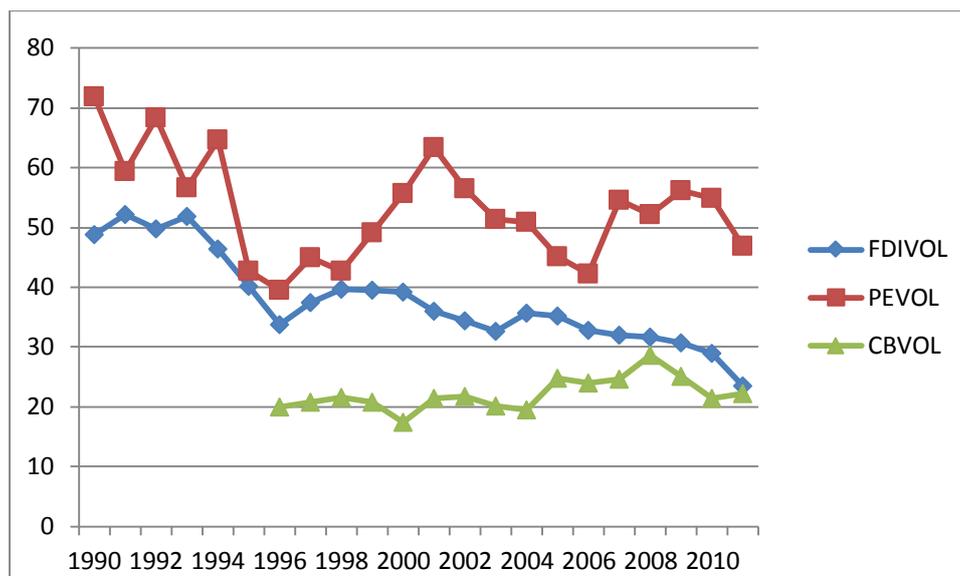


Figure 3.1: Volatilities of private capital flows to sub-Saharan Africa, 1990-2011

Source: Author's calculations using WB WDI online (2016) database and BIS Locational Banking Statistics (2014)

Note: FDI volatility (FDIVOL); Portfolio equity volatility (PEVOL); Cross-border bank lending volatility (CBVOL).

The scale of the vertical axis is the calculated volatilities computed as the standard deviation of capital flows in three-year overlapping rolling windows with capital flow sizes first normalized.

From Figure 3.1 it can be seen that FDI volatility has been steadily decreasing over the reporting period. This is encouraging as since 2000 there has been a steady increase in the FDI to GDP ratio.

3.4.2 Regression results

The results are displayed in table 3.5 and show that the only significant factor that influences FDI volatility is global liquidity (push factor) where a negative relationship is found. Thus, an increase in global liquidity reduces the volatility of FDI. The result is similar to those of IMF (2007) and Mercado and Park (2011). As explained by Mercado and Park (2011), with increasing global liquidity, some of this will be channelled to emerging markets and the resultant shift in foreign investment could result in a reduction of FDI volatility. None of the pull factors significantly influences FDI volatility.

Table 3.5: Determinants of private capital flow volatility

	FDI volatility	Portfolio equity volatility	Bank lending volatility
Global liquidity	-0.575** (-2.45)	0.930(1.21)	-0.346(-1.50)
Global risk	0.296(1.58)	1.133*(1.85)	-0.120(-0.65)
Log GDP	-16.427(-0.73)	-7.948(-0.05)	15.071(0.46)
Exchange rate	0.029(0.78)	2.180**(2.09)	0.053(1.16)
Trade openness	-0.027(-0.24)	0.007(0.02)	0.185(1.14)
Financial openness	0.043(1.02)	-0.484***(-2.99)	-0.078*(-1.80)
Private credit	0.501(1.40)	-2.159(-0.97)	-1.680*(-1.70)
RMSE	8.082	10.072	4.889
Observations	783	156	516
Countries	39	9	33
CD	0.132	0.425	0.388
CIPS	0.000	0.028	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p-values.

The only significant factor that influences FDI volatility is global liquidity (push factor) where a negative relationship is found. Thus, an increase in global liquidity reduces the volatility of FDI. The result is similar to those of IMF (2007) and Mercado and Park (2011). As explained by Mercado and Park (2011), with increasing global liquidity, some of this will be channelled

to emerging markets and the resultant shift in foreign investment could result in a reduction of FDI volatility. None of the pull factors significantly influences FDI volatility.

For the portfolio equity volatility model one push and two pull factors are found to be significant drivers of volatility. Global risk is a global push factor significantly positively related to volatility, implying that greater global uncertainty and risk aversion substitutes flow away from developing economies resulting in weaker and more volatile flows. This is in line with Forbes and Warnock (2012) who found that global risk was significantly associated with extreme episodes of capital flows.

With regard to the pull factors, the proxy for macroeconomic uncertainty (exchange rate) is significantly positively related to volatility, implying that a depreciating exchange rate increases the volatility of portfolio equity flows. An unstable macroeconomic outlook may cause investors to divert funds to safer investments resulting in weaker flows and increasing volatility. The findings here are similar to that of Mercado and Park (2011) who reported that greater exchange rate volatility leads to higher portfolio investment inflow volatility to emerging markets.

In line with the findings of Mercado and Park (2011), another pull factor significant in the portfolio equity volatility model is actual financial openness that reduces volatility. The intuition behind the result mimics the explanation by Reinhardt, Ricci, and Tressel (2013) who showed that a closed capital account indicates weaker and thus more volatile flows.

In the cross-border bank lending model, two pull factors significantly influence volatility. Financial openness is similarly significantly negatively related to volatility. Private credit to GDP as a domestic financial pull factor reduces the volatility of cross-border bank lending, implying that a well-functioning and deep financial system should help attract more stable cross-border bank flows. The last finding differs from Broto et al. (2011) who reported a positive association between private credit to GDP and bank inflow volatility. Broto et al.'s (2011) bank inflow volatility variable derives from the IMF's International Financial Statistics' "other investment" series, which contains other forms of cross-border finance and could explain the difference in results.

The CD and CIPS tests of the residuals also show that the models are devoid of any cross-section dependence and non-stationarity problems.

3.4.1 Robustness

The samples are split according to country income groups per World Bank classification. This process makes it possible to ascertain if the determinants of FDI and cross-border bank lending volatility differ for middle-income countries (MICs) and low-income countries (LICs). The results appear in Appendixes 3.C and 3.D. The portfolio equity volatility sample consists mainly of MICs and is therefore excluded from this analysis. The CD test reveals that the FDI LIC volatility sample cross-section dependence is still prevalent in the residuals. The focus is thus on the FDI MIC volatility and the cross-border banking volatility (MIC and LIC) samples.

The results do not differ much. Similar to the full country FDI sample, global liquidity is significantly negatively related to volatility in the FDI MIC sample. In addition, global risk increases FDI volatility in MICs. For MICs, global push factors, beyond the control of sub-Saharan economies are the drivers of FDI volatility.

For MICs in the cross-border bank lending volatility sample, financial openness reduces volatility similar to the finding from the full country sample. For LICs in the cross-border bank lending volatility sample, global liquidity reduces volatility while a depreciating exchange rate increases volatility. Apart from a global push factor, domestic macroeconomic fundamentals are therefore also relevant in shaping the volatility of cross-border bank lending flows to LICs.

3.5 Conclusion

The chapter presented evidence of the underlying factors of patterns of volatility for FDI, portfolio equity and cross-border bank lending inflows for sub-Saharan African countries. No other study has previously focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility. This study is further unique in that it employs clearly-delineated cross-border bank lending data from the BIS Locational Banking Statistics that has not been used by similar prior studies. The use of a panel time-series estimator, the AMG estimator of Eberhardt and Teal (2010), makes the findings robust to cross-section dependence.

The main findings of the study are as follows: (1) global liquidity lowers FDI volatility, while for MICs global liquidity and global risk are significant drivers of FDI volatility; (2) global risk increases portfolio equity volatility with the quality of macroeconomic policies and financial openness found to be important pull factors in lowering portfolio equity volatility; and (3) financial openness and depth lowers cross-border bank lending volatility. For LICs,

global liquidity lowers cross-border bank lending volatility while the quality of macroeconomic policies is an important pull factor in lowering volatility.

The results indicate that global push factors influence the volatility of all three private capital inflow types, either for the full samples or when the samples are split according to country income group. Because these factors are beyond the control of sub-Saharan African economies it is difficult to draw blanket policy recommendations. Forbes and Warnock's (2012) suggestion that countries apprehensive about capital flow volatility effects should seek to strengthen their capacity to endure these volatile capital episodes rather than reduce the volatility also seems appropriate for sub-Saharan African countries. The IMF (2014) recommended that most sub-Saharan African frontier economies improve the quality of their data in order to monitor capital flows effectively. To use macro-prudential policies effectively, supervisory resources that include adequately trained and qualified staff, the availability of high-frequency data and the tools necessary to assess systemic risks must all be improved (IMF, 2014).

The significance of global push factors in shaping volatility should also reinforce calls for reforming the global financial architecture that has gained weight since the global financial crisis. Global liquidity is likely to become more challenging in years ahead (Marcus, 2014). Sub-Saharan African countries should continue to claim greater representation in international financial institutions, as this will enable broader international policy coordination and ensure that the global financial architecture is more inclusive as well as more responsive to developing countries.

Positively, some of the results also suggest that domestic (pull) factors significantly reduce the volatility of certain private capital inflow types without increasing that of others, suggesting that domestic policy still has a role to play. The results from the portfolio equity volatility sample and from the cross-border bank lending volatility LIC sample suggest that prudent domestic macroeconomic policies must be encouraged. It is easier to manage capital flows effectively if macroeconomic stability is ensured. Governments and Central Banks must put in place policies to maintain stability.

The results also imply that it is important for sub-Saharan African countries to have an actual open capital account to lower the volatility of portfolio equity cross-border bank lending. While the effectiveness of capital controls on volatility was not directly tested, the results suggest that

being more financially open (and by implication having fewer capital controls) is more beneficial.

Finally, the results imply that sub-Saharan African countries should further undertake to develop their financial institutions to increase access to credit and improve financial depth as this should lead to reduced cross-border bank lending volatility.

Appendix 3.A: Variables and data sources

FDI inflows: net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP. Series obtained from World Bank WDI.

Portfolio equity inflows: net inflows from equity securities other than those recorded as direct investment and including shares, stocks, depository receipts (American or global), and direct purchases of shares in local stock markets by foreign investors, and is divided by GDP. Series obtained from World Bank WDI.

Cross-border bank lending: Following Kleimeier, Sander, and Heuchemer (2013) cross-border bank lending is based on the residency principle (similar to balance of payments data) and defined as the practice where a bank in one country makes a loan to a customer who resides in another country. The data is obtained from the BIS Locational Banking Statistics and is divided by GDP.

Volatility of capital inflows: Standard deviation of capital inflows using three-year overlapping rolling windows with the method described in section 3.3.2.

Global liquidity: World money and quasi money (M2) as a percentage of GDP obtained from the World Bank WDI.

Global risk: The VIX index is a measure of the implied volatility of the S&P 500 index options and is seen as a simple proxy for investor risk appetite (IMF, 2013). Data are yearly averages and obtained from the BIS.

GDP: GDP in constant 2005 US\$ obtained from the World Bank WDI.

Exchange rate: The official exchange rate determined by the by national authorities or the rate determined in the legally sanctioned exchange market with the series obtained from the World Bank WDI.

Trade openness: Sum of exports and imports of goods and services measured as a share of gross domestic product with the series obtained from the World Bank WDI.

Financial openness: Following Lane and Milesi-Ferretti (2007), the de facto financial openness indicator was calculated using the ratio of $\frac{(FA_{it}+FL_{it})}{GDP_{it}}$ with FA (FL) denoting the stock of external assets (liabilities).

Private credit: Private credit by deposit money banks and other financial institutions to GDP (%) and obtained from the World Bank Global Financial Development database.

Appendix 3.B: Sample countries

FDI volatility sample: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Gambia, Ghana, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Republic of the Congo, Rwanda, Sao Tome and Principe, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Portfolio equity volatility sample: Botswana, Cameroon, Côte d'Ivoire, Kenya, Mauritius, Senegal, South Africa, Swaziland, Zambia.

Cross-border bank lending sample: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Republic of the Congo, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia.

Appendix 3.C: FDI volatility determinants according to country income level

Table 3.6: *Determinants of FDI volatility according to country income level*

	FDI volatility (MIC)	FDI volatility (LIC)
Global liquidity	-1.128** (-2.59)	-0.272(-1.51)
Global risk	0.690*** (3.04)	0.312(1.09)
Log GDP	-18.372(-0.43)	3.931(0.12)
Exchange rate	0.285(0.55)	-0.029(-0.95)
Trade openness	0.056(0.36)	-0.190(-1.25)
Financial openness	0.010(0.21)	0.138**(2.00)
Private credit	0.587(0.84)	0.732(1.32)
RMSE	8.011	8.173
Observations	373	410
Countries	18	21
CD	0.393	0.024
CIPS	0.000	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p values.

Appendix 3.D: Cross-border bank lending volatility determinants according to country income level

Table 3.7: Determinants of cross-border bank lending volatility according to country income level

	Bank lending volatility (MIC)	Bank lending volatility (LIC)
Global liquidity	0.084(0.33)	-0.843*(-1.94)
Global risk	0.150(0.59)	-0.129(-0.59)
Log GDP	0.281(0.01)	27.925(0.47)
Exchange rate	0.101(0.56)	0.050*(1.69)
Trade openness	0.110(1.58)	0.132(0.37)
Financial openness	-0.101*(-1.84)	-0.087(-1.36)
Private credit	-1.018(-1.00)	-2.820(-1.46)
RMSE	4.439	5.222
Observations	251	265
Countries	16	17
CD	0.196	0.932
CIPS	0.000	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p values.

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CHAPTER FOUR

REMITTANCE VOLATILITY AND FINANCIAL SECTOR DEVELOPMENT IN SUB-SAHARAN AFRICA

4.1 Introduction

This chapter examines the effect of remittance volatility on financial sector development. This is important considering the increased importance of remittances as a source of external financing for sub-Saharan Africa. In addition, unlike in the past, it is now required that migrants transfer funds home through official channels (Adenutsi, Aziakpono, & Ocran, 2012) thereby impacting the formal financial system. With remittance levels complementing financial sector development in sub-Saharan Africa (Gupta, Patillo, & Wagh, 2009), it becomes necessary to investigate whether remittance volatility has an impact as well.

Although still smaller than official development assistance and foreign direct investment inflows, remittances to sub-Saharan Africa have gradually increased, having reached an estimated figure of approximately US\$32 billion in 2013 (Aga & Martinez Peria, 2014). For instance, remittances have increased from 1.6% of GDP in 2006 (Gupta et al., 2009) to 4% of GDP in 2012 (Aga & Martinez Peria, 2014). Several sub-Saharan African economies have started raising extensive external financing at lower interest rates and longer maturities through the securitization of future remittance flows (Jidoud, 2015).

The relevance of remittances is not only connected to the size of the flows but also to the fact that these flows are stable and even move countercyclically (Sayan, 2006). This has become more apparent with the recent global financial crisis (Allen & Giovannetti, 2011). A better understanding of the consequences of remittance-receiving patterns – not only remittance levels – on the receiving economies will become more important in future years considering that the percentage of individuals living in countries other than those of their birth is rising (Amuedo-Dorantes & Pozo, 2012). For policies to leverage the most out of remittance inflows to developing countries it is essential that the predictability of remittances be given full attention (Amuedo-Dorantes & Pozo, 2014).

This study distinguishes between the effect of remittance volatility on financial sector depth and financial sector efficiency. Most studies within the remittances-financial development nexus focused on one characteristic of financial development (financial depth) while this study

extends this to include financial sector efficiency. The study further contributes to the literature by not only focusing on the financial development of banks but also investigating the impact of remittances and remittance volatility on stock markets.

The rest of this chapter is structured as follows: Section 4.2 provides an overview of the relevant literature, Section 4.3 details the methodology employed in the empirical analysis, in Section 4.4 the results from the empirical estimations are presented and in Section 4.5 the chapter is concluded.

4.2 Overview of the relevant literature

4.2.1 Theoretical framework: Remittances and financial sector development

The related literature has not provided a consistent theoretical framework that explains the link between remittances and financial deepening (Ajilore & Ikhida, 2012). Aggarwal, Demirgüç-Kunt, and Martinez Peria (2011) also stated that the link between remittances and financial development, especially for the banking sector, is a priori unclear. Nonetheless, there are several reasons why remittances could positively impact on banking sector development (Demirgüç-Kunt, Cordova, Martinez Peria, & Woodruff, 2011). Firstly, due to remittances being lumpy because of the fixed costs associated with sending, households are settled with excess cash that could increase their demands for banking products as a place of safe storage. Secondly, bank branches might be used to collect interbank and wire transfers with banks in remittance-receiving countries charging processing fees for these transactions that could become a significant source of income. Banks can then expand their outreach to locate closer to recipients. Thirdly, a large portion of remittances are received by households that are possibly excluded from the formal financial sector, these households being in the middle and lower income distribution segments. Banks that act as remittance paying agents could, therefore, offer other banking products to unbanked households. Fourthly, by processing remittance flows banks are provided with information regarding the recipient households' income that could be used to extend credit to otherwise misunderstood borrowers (Demirgüç-Kunt et al., 2011).

Remittances may also impact positively on stock market development. Through smoothing household consumption over time, spending could be delayed via saving and investment in the stock market. This is particularly so if typical asset accumulation products, e.g. pension funds, are lacking or not deemed dependable (Billmeier & Massa, 2009). At a macroeconomic level, Bugamelli and Paterno (2009) found that remittances improved financial stability in

developing countries by reducing the probability of current account reversals. In this instance, current account reversals are conceivably generated by sudden stops of foreign capital as a result of foreign investors' loss of confidence due to worsening fundamentals such as lower reserves and higher external debt. A high level of stable remittances could negate worsening fundamentals from the viewpoint of foreign investors. Consequently, a high level of stable remittances would insulate a country from capital flight from the stock market and thus have a positive impact on stock market development.

Another channel through which remittances may reduce vulnerability in an economy is through improving creditworthiness and facilitating access to international credit markets (Avendano, Gaillard, & Nieto-Parra, 2011). Avendano et al. (2011) built an empirical model for remittance-dependent economies to capture the effect of remittances, through the solvency ratio and volatility of external flows, on credit rating agencies. Their results suggested that the impact of remittances on ratings is enhanced for small, low and middle-income economies. Ratings can also be assigned to unrated countries where remittance flows are high.

However, remittances may also negatively impact on banking sector development. Remittances may help relax the financing constraints of individuals, inducing a lower demand for credit that mitigates credit market development (Aggarwal et al., 2011). In this instance, remittances act as a substitute for banking sector development. Coon (2014) states that the link between remittances and the financial sector is complex. Some financial sector services, e.g. wire-transfer services, could act as complements while other services, e.g. small-business loans, as substitutes.

Although the literature has examined the impact of remittance transfer costs on efficiency, there is a lack of studies on how remittances impact financial sector efficiency (Cooray, 2012). Changes in overhead and operating costs are reflected in bank interest rate margins that are passed on to depositors and lenders (Demirgüç-Kunt & Huizinga, 2004). Cooray (2012) argues that if remittances increase credit availability through larger deposits, remittances could contribute to lower overhead costs and net interest margins. Remittances that increase bank reserves in developing countries (Cooray, 2012) is a further channel that promotes efficiency.

4.2.2 Theoretical framework: Remittance volatility and financial sector development

On the subject of remittance volatility, Amuedo-Dorantes and Pozo (2014) hypothesized that households that receive remittances on an irregular and less predictable basis would be more inclined to use these funds towards asset accumulation. Their argument follows from the

lifecycle permanent income hypothesis and the precautionary saving motive theory. The former advocates that regular and permanent increases in income are consumed. Individuals expecting such income increments over the long run, would allow for an upward adjustment of consumption over their lifecycle. Households view irregular increases in income as ephemeral and cannot depend on them in the long run and are thus more likely to save (Amuedo-Dorantes & Pozo, 2014). The precautionary saving motive theory further supports the notion that irregular income is more likely to be saved. Households that find it difficult to predict future income flows will tend to save more to guard against future income shortfalls (Amuedo-Dorantes & Pozo, 2014). If irregular remittance receipts are more likely to be saved, recipients could possibly have a need for financial products that would allow for the safeguarding of these funds, thereby positively influencing financial sector development.

However, remittance fluctuations could also have a negative macroeconomic effect. Mandelman (2013) developed a heterogeneous agent model that analysed the role of monetary policy in a small open economy where remittance fluctuations are substantial. Impulse responses of the estimated model to a positive remittance shock indicated that households receiving an increase in disposable income record higher consumption levels, shrinking the labour supply because of an increased demand for leisure. As the labour supply decreases, real wages increase and are further stimulated by the consumption boost. Households subsequently react to higher wages by increasing their labour supply and aggregate employment increases slightly. The price of domestically produced goods is pressurized by the increasing real wages and consumption demand, and CPI inflation steadily rises. The central bank reacts and increases the domestic interest rate (Mandelman, 2013). This study therefore argues that remittance volatility could potentially be detrimental to financial sector development.

4.2.3 Empirical review

Similar to the theoretical literature, the empirical literature consists mostly of studies that examined the impact of remittances on financial development and little on the impact of remittance volatility on financial development.

Results from Vargas-Silva (2007) suggest remittances had a positive impact on the general stock market index in Mexico, which is consistent with previous evidence that found remittances invested in productive activities in Mexico. Using a panel of 17 emerging countries in the Middle East and Central Asia, Billmeier and Massa (2009) also found that remittances had a significant positive impact on stock market capitalization. Gupta et al. (2009) pioneered

the empirical exploration of remittances' financial deepening effects in sub-Saharan Africa. Covering six time periods composed of five-year averages from 1975-2004 for 44 economies and using a panel instrumental variable approach they found that remittances positively impacted on financial development.

An important contribution to the related empirical literature was from Aggarwal et al. (2011) who investigated remittance flow data to 109 developing economies from 1975-2007 and the impact on financial sector development. The findings revealed a positive and robust link between remittances and financial development irrespective of the estimation technique employed or whether the ratio of deposits or credit to GDP was the financial development measure.

Recent African panel data studies include the studies of Tarus (2015), Karikari, Mensah and Harvey (2016), and Williams (2016). Tarus (2015) found that remittances enhanced banking sector development for a sample of 23 sub-Saharan African countries from 1994-2009. The results from Karikari et al. (2016) generally indicated that remittances positively influenced certain aspects of financial development in Africa in the short-run but not in the long-run. It was explained that remittances are basically only used for survival purposes. Williams (2016) used a dynamic panel estimator for 45 sub-Saharan countries from 1970-2013 and showed that remittances positively influenced financial development. It was also found that the effect of remittances on financial development did not depend on democratic institutions.

Evidence from time series studies suggest a positive relationship between remittances and financial development. Chowdhury (2011) employed the Johansen cointegration approach and found that remittances contributed positively to the financial system of Bangladesh. Ajilore and Ikhide (2012) used country-level data on Cape Verde, Lesotho, Nigeria, Senegal and Togo to explore the long- and short-run impact of remittances on financial development. The study employed both the Autoregressive Distributed Lag (ARDL) bounds testing approach and the Johansen approach to assess cointegration for the period 1985-2009 and reported that remittances promoted financial development in four of the countries studied except for Nigeria.

Cooray's (2012) study was the first to investigate the impact of remittances on banking sector efficiency. A sample of 94 non-OECD economies was used, and it was found that remittances contributed to increase the size and efficiency of the banking sector. It was also found that where government ownership of banks is lower, remittances had a greater impact in increasing banking sector size, while greater increases in efficiency were found where government

ownership of banks was higher. Similar to Aggarwal et al. (2011), Cooray (2012) employed dynamic panel estimation techniques to account for possible endogeneity bias in the explanatory variables.

Not all empirical studies have found a positive relationship between remittances and financial sector development. Brown, Carmignani, and Fayad (2013) found little evidence that remittances promoted financial development in a sample of 138 countries from 1970-2005, and if anything the effect appeared negative albeit small. Brown et al. (2013) suggest there might be possible non-linearities in the remittances-financial development link and that, in general, findings regarding the impact of remittances are sensitive to the methodological approach. Using an ARDL bounds testing approach from 2000-2010, Raza and Jawaid (2014) found no causal link between remittances and stock market capitalization in 18 Asian countries. Coulibaly (2015) examined the causality between remittances and financial development in 19 sub-Saharan African countries by employing a panel Granger causality approach. The study concluded that no strong evidence existed to support the view that remittances promoted financial development. Differences in sub-Saharan Africa country governance were put forward to explain the heterogeneity in the causality results from remittances to financial development.

In summary, while most of the empirical literature has found a positive relationship between remittances and financial development at a macroeconomic level, evidence remains mixed. Prior studies generally investigate only one characteristic of financial development (financial depth) for financial institutions. The impact of remittances on stock market development and financial sector efficiency has received little attention. This study explores the gap in the literature regarding the link between remittance volatility and financial development for sub-Saharan African countries at a macroeconomic level.

4.3 Methodology

4.3.1 Data

Figure 4.1 depicts the time profile of remittances to 45 sub-Saharan African countries from 1990-2011.

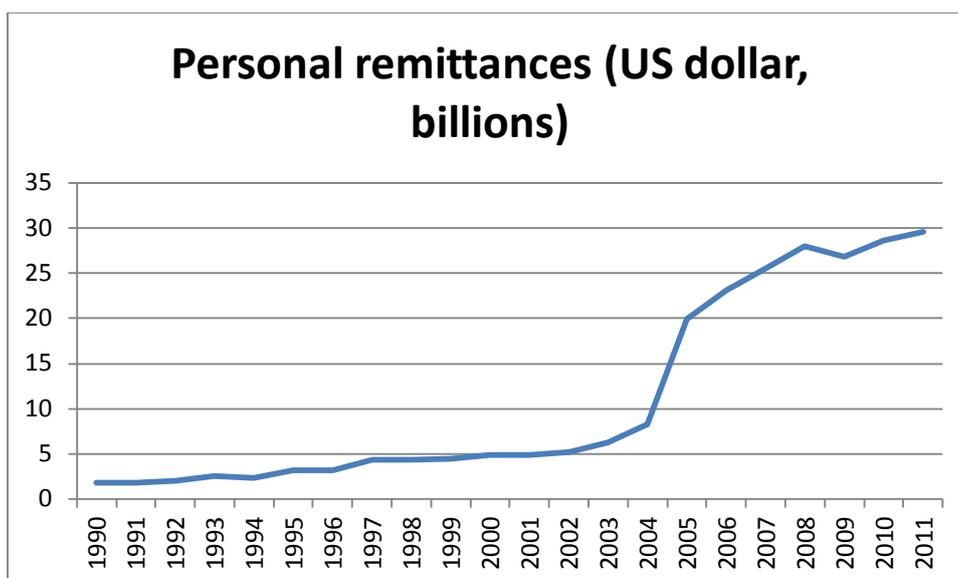


Figure 4.1: Remittances to sub-Saharan Africa: 1990-2011

Source: World Bank WDI (2016)

From Figure 4.1 it can be seen that personal remittances were under US\$5 billion at the turn of the century. During the 2000s it would appear that remittances have increased in importance, with US\$8.27 billion recorded in 2004 and a dramatic rise to US\$19.98 billion in 2005. In 2008, remittances stood at US\$28.03 billion before declining to US\$26.79 billion in 2009, perhaps due to the global financial crisis. However, remittances rose again in 2010 and US\$29.58 billion was recorded in 2011. Nigeria is by far the leading remittances recipient country in sub-Saharan Africa, with US\$20.6 billion recorded in 2011. This figure represents almost 70% of all personal remittances to sub-Saharan African countries in 2011. The next leading recipient countries in sub-Saharan Africa for 2011 were Senegal (US\$1.6 billion), South Africa (US\$1.1 billion) and Kenya (US\$0.9 billion). Table 4.4 in Appendix 4.A indicates personal remittances (% of GDP) to sub-Saharan African countries.

4.3.2 Remittance volatility

The study follows the procedure in Broto, Diaz-Cassou, and Erce (2011) and Lee, Park, and Byun (2013) to compute remittance volatility. As in Broto et al. (2011) and Lee et al. (2013) the standard deviation of capital flows in a rolling window, σ_{it} , is expressed as follows:

$$\sigma_{it} = \left(\frac{1}{n} \sum_{k=t-(n-1)}^t (\text{flow}_{ik} - \mu)^2 \right)^{\frac{1}{2}} \quad (4.1)$$

where $\mu = \frac{1}{n} \sum_{k=t-(n-1)}^t \text{flow}_{ik}$, and flow_{ik} represents remittances for country i in period k .

The study follows Lee et al. (2013) and first normalizes the size of the flows in each of the rolling windows. Because the standard deviation indicates dispersion from the mean, greater remittances flows (and hence greater means) might well exaggerate the volatility size over time if not normalized. Figure 4.2 shows the time profile of the volatility of remittances from 1991 to 2011. The first three-year rolling window is from 1990-1992 and the midpoint, i.e. 1991, is then the first volatility measure.

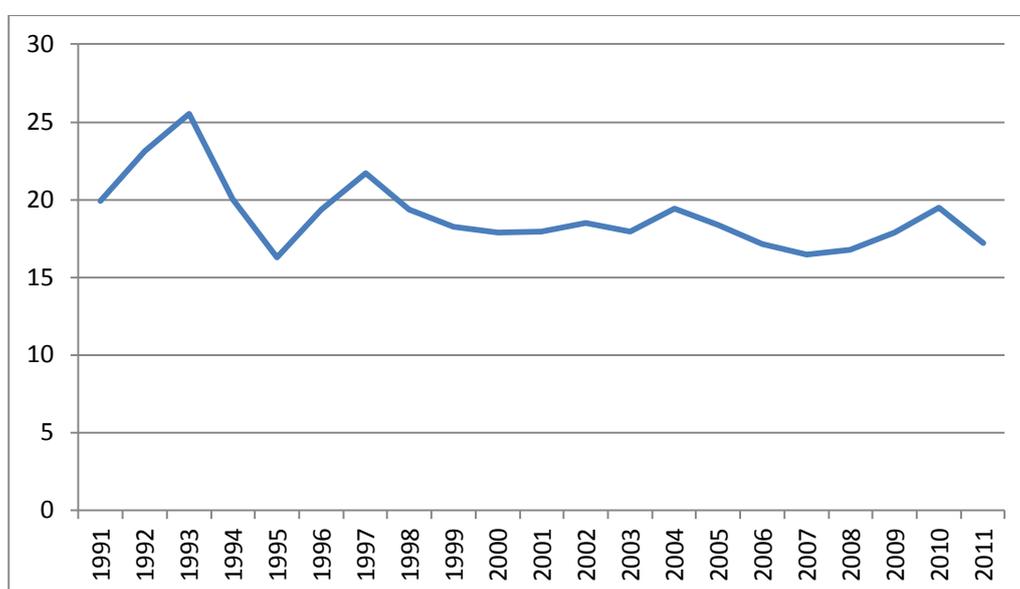


Figure 4.2: Volatility of remittances: 1991-2011

Source: Calculated from World Bank WDI (2016)

Note: The scale of the vertical axis is the calculated aggregate volatility computed as the standard deviation of remittances in three-year overlapping rolling windows with capital flow sizes first normalized.

Figure 4.2 indicates that except for 1998-2001, remittances to sub-Saharan Africa have not been stable at the aggregate level. Table 4.5 in Appendix 4.A indicates the remittance volatility to individual sub-Saharan African countries. Here one can observe even higher volatility spreads across countries. For the full period, 1991-2011, remittance volatility ranged from a low of 6.5 in Namibia to 34.8 in Sierra Leone. The range from 2000-2011 shows the lowest volatility of 3.3 in South Africa compared to 37.7 calculated for Burundi. For the full period,

11 countries show an average volatility above the sample average while, from 2000-2011, 17 countries have a higher average. Remittance volatility in Nigeria is higher than the average in all samples compared to the other leading remittance recipient countries of Senegal, South Africa and Kenya, where the volatility is lower than all the sample averages.

4.3.3 Empirical model: Financial development of banks

To test the impact of remittances and remittance volatility on the financial development of banks, the following dynamic model adapted from Aggarwal et al. (2011) is specified:

$$FD_{it} = \alpha + \gamma FD_{i,t-1} + \beta_1 \text{Remit}_{it} + \beta_2 \text{VolRemit}_{it} + \gamma X'_{it} + \varepsilon_{it} \quad (4.2)$$

The dependent variable (FD) refers to two alternative characteristics of financial development i.e. financial depth and financial efficiency. The model is estimated four times, using two measures of financial depth and two measures of financial efficiency. Remittances (Remit) and remittance volatility (VolRemit) are the main explanatory variables of interest. X_{it} represents a vector of control variables as standard determinants of banking sector development: country size, inflation, trade openness, and capital account openness. The variables are defined as follows:

FD_{it} = Financial depth is measured as deposit money banks' assets to GDP and alternatively as liquid liabilities to GDP of country i at year t . Financial efficiency is measured as the net interest margin (defined as the accounting value of bank's net interest revenue as a share of its average interest-bearing (total earning) assets) and alternatively bank overhead costs to total assets of country i at year t .

Remit_{it} = Personal remittances received/GDP of country i at year t .

VolRemit_{it} = Volatility of remittances measured as the standard deviation of personal remittances received/GDP in three-year overlapping rolling windows of country i at year t .

Country size_{it} = GDP (log) (constant 2005 US\$) of country i at year t .

Inflation_{it} = Consumer price index (log) (2010=100) of country i at year t .

$\text{Trade openness}_{it}$ = Trade/GDP of country i at year t .

$\text{Capital account openness}_{it}$ = Stocks of foreign assets and liabilities/GDP of country i at year t .

A further description of the variables and their data sources appear in Appendix 4.B.

Theoretical underpinning

Following Jackman, Craigwell, and Moore (2009) and Nyamongo, Misati, Kipyegon, and Ndirangu (2012), both remittances and remittance volatility is included in the same empirical model as explanatory variables. In addition, the theoretical literature revealed that remittances and remittance volatility could impact differently on financial development.

The link between remittances and financial development of banks is theoretically a priori unclear. Empirically, Gupta et al. (2009) showed that remittances impacted positively on financial development in sub-Saharan Africa, while Ajilore and Ikhide (2012) provided evidence of a positive link in four of the five sub-Saharan African countries they considered. However, Coulibaly (2015) found no strong evidence that remittances promoted financial development in sub-Saharan African countries.

A remittance shock could result in real wages and consumption demand to increase which would cause interest rates to rise (Mandelman, 2013). Rising interest rates negatively impact on financial sector development, and hence it is possible that a negative relationship between remittance volatility and financial development could ensue.

It is expected that country size is positively related to financial development. The larger the country size, the greater demand for an expanded financial intermediary sector (Chowdhury, 2011). An increase in the inflation rate decreases the real return on financial assets that exacerbates credit market frictions that lead to credit rationing and less intermediary activity (Boyd, Levine, & Smith, 2001). The study therefore expects a negative relationship between inflation and financial development.

Following Gupta et al. (2009) and Chowdhury (2011), trade and capital account openness are expected to be positively related to financial development. Increased openness in the goods and capital markets is expected to increase the demand for financial products, thereby expanding the formal financial system (Chowdhury, 2011). Rather than using the popular Chinn-Ito (2008) Capital Openness Index as a de jure indicator of openness, this study employed a de facto openness indicator using the “External Wealth of Nations Mark II” database (updated) of Lane and Milesi-Ferretti (2007) that measures the stocks of foreign assets and liabilities. The choice of openness indicator centres on the relative time-invariant character of the Chinn-Ito (2008) Index over the short selected time frame.

4.3.4 Empirical model: Stock markets

To test the impact of remittances and remittance volatility regarding stock market development, the following model adapted from Billmeier and Massa (2009) is specified:

$$SD_{it} = \alpha + \beta_1 \text{Remit}_{it} + \beta_2 \text{VolRemit}_{it} + \gamma X'_{it} + \varepsilon_{it} \quad (4.1)$$

The dependent variable (SD) refers to two alternative characteristics of stock market development: stock market depth and stock market efficiency. Remittances (Remit) and remittance volatility (VolRemit) are the main explanatory variables of interest. X_{it} represents a vector of control variables as standard determinants of stock market development: income, inflation, domestic credit, trade openness, and capital account openness. The variables are defined as follows:

SD_{it} = Stock market depth is measured as stock market capitalization to GDP and alternatively as stock market total value traded to GDP of country i at year t . Stock market efficiency is measured as stock market turnover ratio of country i at year t .

Remit_{it} = Personal remittances received/GDP of country i at year t .

VolRemit_{it} = Volatility of remittances measured as the standard deviation of personal remittances received/GDP in three-year overlapping rolling windows of country i at year t .

Income_{it} = GDP per capita (constant 2005 US\$) of country i at year t .

Inflation_{it} = Consumer price index (log) (2010=100) of country i at year t .

$\text{Domestic credit}_{it}$ = Private credit by deposit money bank other financial institutions/GDP of country i at year t .

$\text{Trade openness}_{it}$ = Trade/GDP of country i at year t .

$\text{Capital account openness}_{it}$ = Stocks of foreign assets and liabilities/GDP of country i at year t .

A further description of the variables and their data sources appear in Appendix 4.B.

Theoretical underpinning

Remittances, as an external source of income, can contribute to disposable income for more investing in stocks and may prompt more stock market investment. This study therefore expects a positive relationship between remittances and stock market development. However, a remittance shock could also reduce disposable income and negatively impact stock market development. In addition, the theoretical model of Mandelman (2013) indicated that a

remittance shock could result in real wages and consumption demand increasing which would cause interest rates to rise. This would adversely impact financial intermediation, also negatively influencing stock market development. Therefore, a negative relationship between remittance volatility and stock market development is hypothesized.

Higher income has a positive influence on stock market development (Garcia & Liu, 1999). With respect to inflation, domestic and foreign investors would be hesitant to invest in stock markets situated in countries where there are expectations of high inflation (Yartey & Adjasi, 2007), suggesting a negative link between inflation and stock market development. Therefore a negative relationship between inflation and stock market development is hypothesized.

Financial sector intermediary development can positively impact on stock market development. Banks thus act as complements to stock market development. Yartey (2007) found that financial intermediary development is an important determinant of African stock market development, and this study also expects a positive relationship between domestic credit and stock market development.

An important source of financial development is trade openness (Zhang, Zhu, & Lu, 2015). Increased trade openness may trigger a demand for new financial products (Gries, Kraft, & Meierrieks, 2009). Similarly, a positive relationship between trade openness and stock market development is expected. A positive relationship between capital account openness and stock market development is expected as countries with more open capital accounts are likely to attract more portfolio flows.

4.3.5 Estimation technique

When investigating the link between remittances and banking sector development, endogeneity bias as a result of reverse causality is a concern (Aggarwal et al., 2011). Greater financial development could lead to larger measured remittances because more remittances are measured when channelled through the formal financial system. Also, financial development could lower the cost of remittance transfer thereby leading to an increase in such flows (Aggarwal et al., 2011). To estimate models employed in this study using panel least square estimators could therefore lead to endogeneity bias. Generalised method of moments (GMM) estimators are designed for panel analysis where one of the assumptions regarding the data-generating process are that some regressors could be endogenous (Roodman, 2009). To correct for the possible endogeneity bias in the explanatory variables, this study employs panel GMM estimation techniques using the Arellano & Bover (1995) method. This method is useful for our sample

for it caters for panels with gaps, a feature of sub-Saharan African panel datasets. For small T panels, fixed- or random-effects estimators or fixed-effects estimators combined with instrumental-variable estimators such as GMM are usually relied on (Blackburne & Frank, 2007). Sample countries are provided in Appendix 4.C.

4.4 Results and discussion

Table 4.1: Remittances, remittance volatility and financial depth of banks: system GMM estimation

	Deposit money bank assets/GDP	Liquid liabilities/GDP
Lag of dependent variable	0.960***(0.018)	0.821***(0.035)
Remittances	-0.056(0.034)	-0.063(0.072)
Remittance volatility	-0.071***(0.024)	0.032(0.041)
Log GDP	0.107(0.127)	-0.071(0.173)
Log CPI	0.115(0.655)	1.159(0.210)
Financial openness	0.001**(0.001)	0.001***(0.001)
Trade openness	0.001(0.008)	0.033(0.024)
Sargan test for over-identifying restriction:		
p -value	0.743	0.200
2nd order autocorrelation: p -value	0.116	0.246
Observations	260	269
Countries	35	36

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.2: Remittances, remittance volatility and financial efficiency of banks: system GMM estimation

	Net interest margin	Overhead costs to total assets
Lag of dependent variable	0.762***(0.045)	0.377***(0.087)
Remittances	-0.005(0.012)	0.006(0.021)
Remittance volatility	0.019*(0.011)	0.038***(0.015)
Log GDP	0.044(0.074)	0.054(0.085)
Log CPI	0.034(0.386)	0.436(0.429)
Financial openness	-0.001***(0.001)	-0.001***(0.001)
Trade openness	0.001(0.004)	-0.001(0.008)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.381	0.571
2nd order autocorrelation: <i>p</i> -value	0.544	0.153
Observations	251	251
Countries	33	33

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.3 presents results for banks' financial depth models. The lagged values of the dependent variables for the deposit money bank assets/GDP and liquid liabilities/GDP models are statistically significant, indicating a high level of persistency in financial depth.

This study hypothesized that remittance volatility will negatively impact on financial sector development. In Table 4.3 evidence is provided to support this notion as a statistically significant and negative relationship is found between remittance volatility and deposit money bank assets/GDP. The finding can be explained by Mandelman's (2013) theoretical model that predicts that a remittance shock would lead to higher consumption, decreasing labour supply and higher real wages. Subsequently the price of domestically produced goods would come under pressure, with central banks hiking interest rates to contain inflation. Therefore, financial depth would be adversely affected. However, the remittance volatility coefficient is not found to be significant in the liquid liabilities/GDP model.

Contrary to the findings of Gupta et al. (2009) for sub-Saharan Africa, no evidence in either of the financial depth models is found that remittances act as a positive determinant of financial development. The findings are in line with Coulibaly (2015) who also found no strong evidence

to support the notion that remittances promote financial development in sub-Saharan African countries. However, some evidence was found that remittance volatility negatively impacts on financial sector depth as previously explained.

Capital account openness has a significant positive coefficient in both the deposit money bank assets/GDP and liquid liabilities/GDP models. Gupta et al. (2009) also indicated that capital account openness positively relates to financial development.

Table 4.4 presents results for banks' financial efficiency models. The lagged values of the dependent variables for the net interest margin and overhead costs to total assets models are statistically significant, also indicating a high level of persistency in financial efficiency.

In both the net interest margin and overhead costs to total assets models, evidence is found that remittance volatility is detrimental to banks' financial efficiency. An increase in remittance volatility would increase banks' net interest margins and overhead costs to total assets. Banks end up charging more and/or asking for profit with increased remittance volatility.

In both the net interest margin and overhead costs to total assets models, no evidence is found of a relationship between remittances and banks' financial efficiency. This evidence is contrary to the findings of Cooray (2012), where for 94 countries an increase in remittances leads to a decrease in overhead costs and net interest margins.

In both the net interest margin and overhead costs to total assets models, capital account openness has a statistically negative coefficient. An increase in capital account openness lowers net interest margins and overhead costs to total assets. Cooray (2012) provided some evidence that capital account openness enhances banks' financial efficiency.

The post-estimation diagnostics is as expected in all models, with the Sargan test of over-identification failing to reject the null hypothesis that the over-identification restrictions are valid. Regarding the Arellano and Bond GMM procedure that tests for first order and second order serial correlation in the disturbances, the null hypothesis of the absence of first order serial correlation should be rejected while one should not reject the absence of second order serial correlation (Baltagi, Demetriades, & Law, 2009).

Table 4.3: Remittances, remittance volatility and stock market development

	Stock market capitalization/GDP	Stock market total value traded/GDP	Stock market turnover ratio
Remittances	0.384(0.929)	-0.114(0.495)	0.447*(0.259)
Remittance volatility	0.130(0.173)	-0.044(0.088)	-0.040(0.051)
Income	-0.002(0.004)	0.006(0.003)	-0.001(0.001)
Inflation	-1.913(6.123)	-9.612**(3.364)	-1.747(1.718)
Domestic credit	1.470*** (0.212)	1.200*** (0.217)	0.382*** (0.047)
Trade openness	0.189(0.125)	0.057(0.050)	0.001(0.033)
Financial openness	0.005(0.063)	0.041**(0.017)	-0.008(0.018)
R ²	31.79	55.68	21.93
Observations	97	101	94
Countries	12	12	12
Hausman (<i>p</i> -value)	0.929	0.030	0.345
Estimator	Random Effects	Fixed Effects	Random Effects

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.3 presents results for stock markets' financial depth models: the stock market capitalization/GDP model and the stock market total value traded/GDP model. Table 4.3 also presents the results for one indicator of stock market efficiency: the stock market turnover ratio model.

While a GMM estimator is appropriate for the bank models, using that estimator for the stock market models results in instrument proliferation because of the low number of countries and observations. The *F*-test is firstly used to test the validity of the fixed effects models in relation to the pooled models. For all stock market models, the *F*-test enables the rejection of the null hypothesis of homogeneity at 1% level and thus it is concluded that individual-specific factors are present that drive stock market development. The models that are therefore applicable are either fixed effect or random effect. For the stock market total value traded/GDP model, the Hausman-test leads to the rejection of the null hypothesis that random effects provide consistent estimates. A fixed effects model with Driscoll-Kraay standard errors is used for the stock market total value traded/GDP model. For the stock market capitalization/GDP model and stock market turnover ratio model, the Hausman test's null hypothesis could not be rejected, and random effects models are specified.

Remittances significantly impact stock market efficiency (as measured by the turnover ratio) but do not significantly impact stock market size and depth. Remittance volatility has no significant effect on any of the stock market indicators.

The leading determinant of stock market development is domestic credit, which has a significant positive coefficient at a 1% level in all three models. Banking sector development therefore complements stock market development in sub-Saharan Africa. Yartey (2007) also found that financial intermediary development is an important determinant of stock market development in Africa.

As expected, inflation has a statistically negative coefficient in the stock market total value traded/GDP model, and also model as expected. Capital account openness has a statistically positive coefficient in the stock market total value traded/GDP.

4.4.1 Robustness

Finally, to check the robustness of the results, this study re-estimated the models in two variations. The first variation has remittances as one of the explanatory variables, and there is no remittance volatility. The second variation has remittance volatility as one of the explanatory variables, but does not have the remittances variable. The results are reported in Appendix 4.D do not differ from the main results.

4.5 Conclusion

This study provides some evidence that remittance volatility is detrimental to banking sector depth. The results further indicate that remittance volatility increases bank spread and negatively affects banking sector efficiency. A remittance shock would result in real wages and consumption demand increasing, causing interest rates to rise and thus negatively impacting banking sector development (Mandelman, 2013). No evidence is found that remittance volatility is related to stock market development. A policy implication is that sub-Saharan African countries should have measures in place to monitor the predictability of remittances. This is important as sub-Saharan Africa is the third highest recipient of remittances as a percentage of GDP (Adenutsi et al., 2012).

The policy question regarding the cost of remittance transfer also needs to be looked at. Freund and Spatafora (2008) provided evidence that high transaction costs deter migrants from sending money home or else using informal channels to remit. Sub-Saharan Africa remains the most expensive region to send money to (World Bank, 2015). A natural question pertains to whether the volatility of remittances could be linked to the associated transaction cost. In other words,

do some remittances end up via informal channels due to the high cost of transfer and subsequently result in irregularity and volatility of flow in the formal financial system? Lowering transaction costs should result in more remittances being channelled through formal channels, making flows more predictable and less volatile. The formal financial sector should also investigate which other financial demands remittance-recipients have beyond just offering savings accounts. Further research is required to ascertain whether linking remittances with additional financial services may generate positive economic change.

It is important to note that the link between remittances and the financial sector is complex, where some financial sector services, e.g. wire-transfer services, could act as complements while other services, e.g. small-business loans, could act as substitutes (Coon, 2014). Empirical analysis at microeconomic level regarding the impact of remittances on recipient households' use of bank services is still limited to a relatively small number of countries (Brown et al., 2013) and could provide scope for future research, seeing that empirical analysis at macroeconomic level have yielded mixed results thus far.

Appendix 4.A: Remittances and remittance volatility in sub-Saharan Africa

Table 4.4: Remittances to sub-Saharan African countries (% of GDP)

Country	1990	1995	2000	2005	2007	2008	2009	2010	2011
Benin	5.2	4.6	3.3	3.1	4.0	2.9	1.8	2.0	2.2
Botswana	2.3	1.3	0.3	1.2	0.8	0.4	0.1	0.2	0.1
Burkina Faso	4.5	3.3	2.6	1.0	1.2	1.2	1.1	1.3	2.1
Burundi	n/a	n/a	n/a	0.01	0.01	0.2	1.6	1.7	1.9
Cabo Verde	19.3	21.7	16.1	14.1	9.2	8.7	8.0	7.9	9.5
Cameroon	0.2	0.1	0.2	0.5	0.8	0.7	0.8	0.5	0.8
Congo, DR	n/a	n/a	n/a	0.1	0.1	0.1	0.1	0.1	0.5
Congo, Rep	0.2	0.2	0.3	0.2	0.2	n/a	n/a	n/a	n/a
Côte d'Ivoire	0.4	1.4	1.1	1.0	0.9	0.8	1.3	1.5	1.6
Ethiopia	0.04	0.4	0.6	1.4	1.8	1.4	0.8	1.2	1.6
Gambia	n/a	n/a	n/a	9.5	7.0	6.7	8.9	12.1	11.9
Ghana	0.1	0.3	0.7	0.9	0.5	0.4	0.4	0.4	5.4
Guinea	0.7	0.02	0.04	1.4	0.4	1.4	1.1	1.0	1.3
Guinea-Bissau	0.4	0.7	2.2	3.4	6.2	5.7	5.9	5.4	4.7
Kenya	1.6	3.3	4.2	2.3	2.0	1.9	1.7	1.7	2.2
Lesotho	78.6	47.7	61.9	43.8	39.9	35.3	32.0	27.9	25.7
Liberia	n/a	n/a	n/a	5.8	8.4	6.8	2.2	2.4	23.3
Malawi	n/a	0.03	0.04	0.6	0.5	0.3	0.3	0.3	0.3
Mali	4.0	4.1	2.5	2.8	4.2	4.4	4.5	4.4	6.0
Mauritius	n/a	3.3	3.9	0.01	0.01	0.01	0.01	0.01	0.01
Mozambique	2.8	2.3	0.7	0.8	1.1	1.0	1.0	1.1	1.0
Namibia	0.5	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Niger	0.6	0.4	0.8	1.9	1.8	1.7	1.9	2.3	2.6
Nigeria	0.03	2.8	3.0	13.0	10.8	9.2	10.8	5.3	5.0
Rwanda	0.1	1.6	0.4	0.3	3.2	1.4	1.7	1.9	2.7
Sao Tome and Principe	n/a	n/a	n/a	1.2	1.4	1.6	1.0	3.3	2.9
Senegal	2.5	3.0	5.0	9.1	10.6	11.0	10.5	11.4	11.2
Seychelles	2.0	0.1	0.5	1.3	0.5	0.3	1.9	1.8	2.4
Sierra Leone	0.01	2.7	1.1	0.1	1.9	0.9	1.4	1.7	2.0
South Africa	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Sudan	0.5	2.5	5.2	2.7	2.2	2.9	2.6	2.2	1.2
Swaziland	10.1	4.9	3.7	3.7	3.1	3.0	3.0	1.5	0.8
Tanzania	n/a	0.02	0.08	0.1	0.1	0.1	0.1	1.1	1.2

Togo	1.7	1.1	2.6	9.1	11.3	10.7	10.6	10.6	6.5
Uganda	n/a	n/a	3.8	3.6	3.7	5.1	4.4	3.8	4.0
Zambia	n/a	n/a	n/a	0.6	0.4	0.4	0.3	0.2	0.2

Source: World Bank WDI (2016)

Table 4.5: Remittance volatility to sub-Saharan African countries

Country	Average volatility 1991-2011	Average volatility 2000-2011	Average volatility 2007-2011
Benin	17.6	20.2	18.4
Botswana	17.1	19.5	25.9
Burkina Faso	12.5	12.2	4.6
Burundi	n/a	37.7	34.6
Cabo Verde	9.7	8.6	9.4
Cameroon	21.3	19.4	16.4
Congo, DR	n/a	29.8	31.8
Congo, Rep	26.4	31.0	n/a
Côte d'Ivoire	9.6	7.0	16.9
Ethiopia	28.0	25.3	21.6
Gambia	n/a	13.8	16.2
Ghana	14.2	12.5	6.2
Guinea	34.2	32.0	22.7
Guinea-Bissau	15.0	15.0	7.5
Kenya	13.2	11.5	9.1
Lesotho	10.4	9.1	9.3
Liberia	n/a	35.4	38.4
Malawi	15.7	15.1	16.5
Mali	9.7	9.5	9.6
Mauritius	16.8	21.1	18.3
Mozambique	13.9	12.2	8.6
Namibia	6.5	6.6	8.7
Niger	20.9	14.8	9.2
Nigeria	24.9	21.2	16.8
Rwanda	27.9	22.6	22.9
Sao Tome and Principe	n/a	21.2	23.1
Senegal	7.3	8.5	3.9
Seychelles	34.3	32.2	32.3
Sierra Leone	34.8	30.7	21.4

South Africa	8.4	3.3	3.1
Sudan	24.0	19.4	24.4
Swaziland	10.5	11.3	19.4
Tanzania	24.2	18.6	16.3
Togo	17.6	12.8	2.4
Uganda	n/a	12.9	9.4
Zambia	n/a	15.3	15.5
Average	18.2	18.0	16.3

Source: Calculated from World Bank WDI (2016)

Appendix 4.B: Variables and data sources

Financial development (banks): Financial depth is measured as deposit money banks' assets/GDP and alternatively as liquid liabilities/GDP. Following Cooray (2012), financial efficiency is measured as the net interest margin and alternatively bank overhead costs to total assets. The variables are obtained from the World Bank Global Financial Development Database.

Financial development (stock markets): Financial depth is measured as stock market capitalization/GDP and alternatively as stock market total value traded/GDP. Financial efficiency is measured as stock market turnover ratio. Stock market turnover ratio is the ratio of the value of total shares traded to average real market capitalization. The variables are obtained from the World Bank Global Financial Development Database.

Remittances: The study uses the recent estimate of personal remittances received/GDP where the data are the sum of personal transfers and compensation of employees as defined in the sixth edition of the IMF's Balance of Payments Manual with data obtained from the World Bank WDI. Personal transfers comprise current transfers in cash or in kind that was made or received between resident households/individuals and non-resident households/individuals. The compensation of employees concerns the income of border, seasonal as well as other short-term employees that are employed in a country where they are not resident and also of residents being employed by non-residents.

Volatility of remittances: Standard deviation of personal remittances received/GDP using three-year overlapping rolling windows with the method described in section 4.3.2.

Country size (Banks): GDP in constant 2005 US\$ obtained from the World Bank WDI.

Income (Stock markets): GDP per capita in constant 2005 US\$ obtained from the World Bank WDI.

Inflation: Consumer price index (log) (2010=100) reflects changes in the cost to the average consumer of acquiring a basket of goods and services. The series is obtained from the World Bank WDI.

Domestic credit (Stock markets): Private credit by deposit money banks and other financial institutions to GDP (%) with the series obtained from the World Bank Global Financial Development database.

Trade openness: Sum of exports and imports of goods and services measured as a share of GDP with the series obtained from the World Bank WDI.

Financial openness: The Lane and Milesi-Ferretti (2007) “External Wealth of Nations Mark II” database (updated) was used to calculate the de facto financial openness indicator using the ratio of $\frac{(FA_{it}+FL_{it})}{GDP_{it}}$ with FA (FL) denoting the stock of external assets (liabilities).

Appendix 4.C: Sample countries

Banking sector development models: Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Côte d’Ivoire, Democratic Republic of the Congo, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia.

Stock market development models: Botswana, Côte d’Ivoire, Ghana, Kenya, Malawi, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, Zambia.

Appendix 4.D: Robustness

Table 4.6: Remittances, remittance volatility and financial depth of banks: system GMM estimation

	Deposit money bank assets/GDP	Deposit money bank assets/GDP
Lag of dependent variable	0.968***(0.018)	0.966***(0.018)
Remittances	-0.023(0.031)	n/a
Remittance volatility	n/a	-0.064***(0.024)
Log GDP	-0.003(0.118)	0.114(0.127)
Log CPI	0.451(0.610)	0.078(0.655)
Financial openness	0.001*(0.001)	0.001**(0.001)
Trade openness	-0.005(0.007)	-0.006(0.006)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.259	0.823
2nd order autocorrelation: <i>p</i> -value	0.306	0.130
Observations	277	260
Countries	35	36

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.7: Remittances, remittance volatility and financial depth of banks: system GMM estimation

	Liquid liabilities/GDP	Liquid liabilities/GDP
Lag of dependent variable	0.830***(0.029)	0.827***(0.031)
Remittances	-0.046(0.076)	n/a
Remittance volatility	n/a	0.036(0.043)
Log GDP	-0.062(0.156)	-0.039(0.178)
Log CPI	1.222(0.829)	1.000(0.970)
Financial openness	0.001***(0.001)	0.001***(0.001)
Trade openness	0.030(0.022)	0.026(0.018)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.297	0.212
2nd order autocorrelation: <i>p</i> -value	0.229	0.246
Observations	286	269
Countries	36	36

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.8: Remittances, remittance volatility and financial efficiency of banks: system GMM estimation

	Net interest margin	Net interest margin
Lag of dependent variable	0.754***(0.043)	0.762***(0.044)
Remittances	-0.001(0.015)	n/a
Remittance volatility	n/a	0.019*(0.011)
Log GDP	0.120(0.109)	0.045(0.074)
Log CPI	-0.217(0.530)	0.029(0.391)
Financial openness	-0.001**(0.001)	-0.001***(0.001)
Trade openness	-0.002(0.004)	0.001(0.003)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.105	0.385
2nd order autocorrelation: <i>p</i> -value	0.330	0.547
Observations	265	251
Countries	34	33

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.9: Remittances, remittance volatility and financial efficiency of banks: system GMM estimation

	Overhead costs to total assets	Overhead costs to total assets
Lag of dependent variable	0.455***(0.086)	0.377***(0.089)
Remittances	-0.004(0.016)	n/a
Remittance volatility	n/a	0.038***(0.014)
Log GDP	0.096(0.078)	0.051(0.087)
Log CPI	0.267(0.376)	0.441(0.433)
Financial openness	-0.001**(0.001)	-0.001***(0.001)
Trade openness	-0.002(0.006)	-0.001(0.006)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.004	0.567
2nd order autocorrelation: <i>p</i> -value	0.098	0.153
Observations	265	251
Countries	34	33

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.10: Remittances, remittance volatility and stock market development

	Stock market capitalization/GDP	Stock market capitalization/GDP
Remittances	0.352(0.907)	n/a
Remittance volatility	n/a	0.132(0.173)
Income	-0.001(0.004)	-0.002(0.004)
Inflation	-2.252(5.915)	-1.622(6.072)
Domestic credit	1.464*** (0.200)	1.482*** (0.202)
Trade openness	0.178(0.118)	0.175(0.123)
Financial openness	-0.009(0.054)	0.005(0.063)
R ²	31.80	31.42
Observations	101	97
Countries	12	12
Estimator	Random Effects	Random Effects

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.11: Remittances, remittance volatility and stock market development

	Stock market total value traded/GDP	Stock market total value traded/GDP
Remittances	-0.128(0.494)	n/a
Remittance volatility	n/a	-0.043(0.086)
Income	0.005*(0.003)	0.006(0.003)
Inflation	-9.208*** (2.679)	-9.616** (3.304)
Domestic credit	1.198*** (0.227)	1.198*** (0.211)
Trade openness	0.743(0.048)	0.057(0.048)
Financial openness	0.025*(0.012)	0.042** (0.017)
R ²	54.75	55.65
Observations	105	101
Countries	12	12
Estimator	Fixed Effects	Fixed Effects

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 4.12: Remittances, remittance volatility and stock market development

	Stock market turnover ratio	Stock market turnover ratio
Remittances	0.433*(0.255)	n/a
Remittance volatility	n/a	-0.041(0.051)
Income	-0.001(0.001)	-0.001(0.001)
Inflation	-1.732(1.666)	-1.606(1.735)
Domestic credit	0.379*** (0.049)	0.384*** (0.048)
Trade openness	0.010(0.032)	0.002(0.033)
Financial openness	-0.006(0.015)	-0.009(0.018)
R ²	20.80	20.19
Observations	98	94
Countries	12	12
Estimator	Random Effects	Random Effects

Note: ***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

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CHAPTER FIVE

CROSS-BORDER BANKING VOLATILITY AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

5.1 Introduction

This chapter analyses the effect of cross-border banking volatility on economic growth in Africa. Cross-border bank lending in Africa has increased tremendously over the past decade, with most of the flows being directed to middle-income countries (Hou, Keane, Kennan, Massa, & te Velde, 2013). Not only have European banks significantly increased their exposure in the past decade but other emerging economies, e.g. Brazil and India, have similarly increased lending to the region. Using the Bank for International Settlements (BIS) Consolidated Banking Statistics, Hou et al. (2013) estimated cross-border bank lending to sub-Saharan Africa at US\$138 billion in September 2012, which is much higher than the reported foreign direct investment (FDI) net inflows (US\$40.9 billion), bond flows (US\$6 billion), and portfolio equity net inflows (US\$8.3 billion) combined for 2011.

However, cross-border bank lending has not received much attention in the empirical literature until recent times (Herrmann & Mihaljek, 2013). Studies that have attempted to fill this gap in the literature include the work of Bruno and Shin (2013), Kleimeier, Sander, and Heuchemer (2013) and Müller and Uhde (2013). An important and yet hardly explored area is the impact of cross-border banking volatility on economic growth. Herrmann and Mihaljek (2013) state that cross-border banking, similar to portfolio equity and bond flows, tends to be highly volatile affecting macroeconomic and financial stability.

African country research must analyse the effect of cross-border banking volatility on growth because empirical evidence has revealed that cross-border banking exacerbates global financial shocks (Beck, Fuchs, Singer, & Witte, 2014). Foreign banks almost completely dominate the banking sectors of some African countries including Benin, Burkina Faso, Lesotho, Madagascar, Mozambique, and Zambia. In countries such as Botswana, Namibia, Niger, and Senegal foreign banks control between 60%–80% of total banking sector assets (Beck et al., 2014). Total foreign claims on developing countries held by banks reporting to the BIS decreased by US\$500 billion in the second half of 2008 and the long-term effects on growth could be substantial (Brambila-Macias, Massa, & Murinde, 2011). It is, therefore, important to

appreciate that the potential benefits of more cross-border banking flows might be conditional on their volatility and this necessitates further examination. Private capital flow shocks can be responsible for the poor response of sub-Saharan African countries' economic performance to private capital inflows (Alley, 2015).

Studies that have attempted to examine the relationship between cross-border bank lending and economic growth for sub-Saharan African countries include those of Brambila-Macias and Massa (2010) and Brambila-Macias et al. (2011). This study is motivated in two ways. Unlike the previously mentioned sub-Saharan African studies, this study examines the impact of cross-border banking volatility on economic growth. Also, the study distinguishes between loans and deposits and analyses their impact on economic growth separately. Both cross-border bank lending and deposits could have an impact on economic growth, but this impact could vary. For instance, depositors may engage in capital flight at times of crises while habit persistence characterized by high switching and information costs are more expected for cross-border loans (Kleimeier et al., 2013).

While the terms cross-border bank lending and cross-border banking are used at times interchangeably in the literature, it is important to note that there is a difference. Kleimeier et al. (2013) use the term cross-border banking to refer to both banks as well as banking customers that "go abroad". Sander, Kleimeier, and Heuchemer (2013) state that an emerging consensus in the literature proposes that cross-border banking analysis must focus on gross as opposed to net stocks and flows. Hence, this brings to the fore the importance of differentiating between assets (loans) and liabilities (deposits). Kleimeier et al. (2013) found that cross-border banking loans and deposits responded differently according to different types of financial crisis and concluded that future studies should explicitly and separately analyse both banking markets.

The rest of this chapter is structured as follows: Section 5.2 provides an overview of the relevant literature, Section 5.3 details the methodology employed in the empirical analysis, in Section 5.4 the results of the empirical estimations are presented and in Section 5.5 the chapter is concluded.

5.2 Overview of the relevant literature

5.2.1 Theoretical framework

Private capital flows can enhance growth through various channels: by increasing the domestic investment rate, through spurring investment associated with positive spill overs, and by leading to increased domestic financial intermediation (Bailliu, 2000).

This paper uses an extension of the endogenous growth model, the ‘AK’ model, of Pagano (1993) to examine the link between capital flows and growth. The potential effects of changes in financial variables (financial development and capital flows) on steady-state growth through their impact on capital accumulation are highlighted by an endogenous growth framework (Bailliu, 2000).

Following Pagano (1993), in the closed economy version of the ‘AK’ model, aggregate output is a linear function of aggregate capital stock:

$$Y_t = \beta K_t \quad (5.1)$$

In the stated growth function, Y_t represents aggregate output in time t , K_t signifies capital stock in time t , while β is the marginal productivity of capital. The following assumptions are made: (i) there is no population growth, and (ii) the economy only produces one good that can be consumed or invested. If the single good is invested and assuming capital stock depreciates at a rate of α per period, gross investment equals:

$$I_t = K_{t+1} - (1 - \alpha)K_t \quad (5.2)$$

Aggregate investment is a change in aggregate capital stock less depreciation (α). In a closed economy with capital market equilibrium state, all savings are channelled to investment:

$$S_t = I_t \quad (5.3)$$

To transform savings into investment involves the financial sector through financial intermediation and a proportion of savings ($1 - \delta$) is lost for services rendered. For each proportion of savings, δS invested, ensures capital market equilibrium:

$$\delta S_t = I_t \quad (5.4)$$

From equations (5.1), (5.2) and (5.4), and after eliminating the time indices, the growth rate of output (g) in a closed economy with financial intermediation is given by:

$$g_y = \beta \left(\frac{I}{Y} \right) - \alpha = \beta \delta s - \alpha \quad (5.5)$$

In equation (5.5), s represents the gross savings rate. Two main channels through which financial development can impact economic growth are revealed by this equation. The first channel concerns the efficient allocation of savings to investment. As banks increase their intermediary role, they are likely to become more efficient with the spread between their lending and borrowing rates decreasing. The proportion of savings channelled to investment will increase, hence g in equation (5.5) will increase as a result of an increase in δ . The second

channel involves the allocation of capital. As banks increase their intermediary role, they are likely to gain experience in evaluating alternative investment projects. Banks will also be able to channel a greater portion of funds to projects where the marginal product of capital is higher because of banks' increased risk-sharing expertise.

The previous framework can be extended to incorporate international capital flows following Bailliu (2000). It is now assumed that foreign investors can invest in this economy through financial intermediaries. Allowing for international capital flows, the capital market equilibrium becomes:

$$\delta^*(S_t + FCF_t) = I_t^*$$

FCF_t represents net international capital flows and the steady-state growth rate is now given by:

$$g_y^* = \beta^* \delta^* s^* - \alpha$$

In the presence of international capital flows, g_y^* will be greater than g_y if s^* is greater than s , all else being equal. It then follows that I_t^* will be greater than I_t . Capital flows must finance investment and not consumption and must also not crowd out locally financed investment. If capital flows spur investment that creates positive spill overs, the marginal productivity of capital will increase and β^* will tend to be greater than β , all else being equal. The extent to which capital flows are intermediated by local financial institutions will tend to have a positive growth impact as the local banking sector will become more efficient. Thus, δ^* will be greater than δ , and the marginal productivity of capital could also increase as banks would be able to select better investment projects (i.e. $\beta^* > \beta$).

The above framework has indicated that one of the channels through which private capital flows can impact growth is through increased local financial intermediation. However, the potential growth effects of private capital flows also depends on the level of financial development. The theoretical model of Aghion, Bacchetta, and Banerjee (2004) indicated that unrestricted financial liberalization and fully opening the economy to foreign lending might destabilize the economy if the domestic financial sector is not sufficiently well developed.

Cross-border banking could have a positive influence on the banking sector of the host economy by increasing competition, enhancing credit growth, lowering volatility and ensuring

the transfer of best practices concerning supervision and regulation (Beck et al., 2014). Critics of cross-border banking argue that foreign banks could also have a negative influence on the banking sector of the host economy. Possible reasons could be because of crowding the market without effectively increasing competition, decreasing the system-wide outreach to lower end clients, increasing contagion risks and by overwhelming supervisors who do not possess the appropriate capacity or skills set, and so risk financial system stability (Beck et al., 2014).

Negative consequences of large capital inflows include exchange rate appreciation, less competitive export sectors and thus possible reduced growth. If capital inflows occur in the context of a current account deficit, the real appreciation could worsen external imbalances and make the economy vulnerable to capital inflow reversals (Cardarelli, Elkedag, & Kose, 2009). Stiglitz (2000) argued that capital flight could have adverse effects on growth. Volatility is one observable characteristic of capital flight (Ferreira & Laux, 2009). Increasing capital flow volatility could result in excess exchange rate volatility that increases inflation uncertainty and encourages speculative financial investment by financial and real sector firms (Demir, 2009).

According to Bailliu (2000), the theoretical models of Krugman (1998) and Corsetti, Pesenti, and Roubini (1998) present frameworks where policy distortions can cause large capital inflows being channelled to speculative investment. These frameworks highlight moral hazard associated with poorly regulated financial intermediaries whose liabilities are guaranteed by the government. These intermediaries have an incentive to engage in risky lending and finance speculative projects through external borrowing. If foreign creditors perceive that they will be bailed out by the government, domestic banks could become recipients of large capital inflows that will subsequently be channelled to unproductive investments (Bailliu, 2000).

5.2.2 Review of empirical literature

Similar to the theoretical literature, the empirical literature consists mostly of studies that examined the impact of cross-border banking on economic growth but there is little on the impact of cross-border banking volatility on economic growth. In addition, the cross-border banking and economic growth empirical literature has focused predominantly on cross-border bank lending as opposed to deposits.

Reisen and Soto (2001) investigated the independent growth effect of different private capital flow types including short-term and long-term debt. Using panel data analysis covering 44 developing countries from 1986-1997, foreign bank lending contributed to growth only if the banking sector was well capitalized. Durham (2003) investigated the impact of different private

capital flow types on growth, including other foreign investment, using data from 1977-2000. Other foreign investment, primarily bank lending, was found to have a negative impact on growth. This effect was mitigated by initial financial development.

Empirical studies that have investigated the link between cross-border bank lending and economic growth in sub-Saharan Africa include the studies of Brambila-Macias and Massa (2010) and Brambila-Macias et al. (2011). Brambila-Macias and Massa (2010) employed the bias-corrected least-squares dummy variables (LSDV) estimator to investigate the link between economic growth and four distinct private capital flow types in 15 selected sub-Saharan African countries from 1980-2008. It was found that a 10% decrease in cross-border bank lending reduced economic growth by 1.5%. Brambila-Macias et al. (2011) examined the long run growth impact of FDI and cross-border bank lending and isolated the outcomes of four groups: (i) all African economies; (ii) all African economies except South Africa, Algeria, Nigeria and Egypt; (iii) natural resource countries; and (iv) countries that do not have a sizable hydrocarbon endowment. Using GMM panel data techniques, it was found that cross-border bank lending has a positive impact on African countries as a whole but the effect becomes negative when only oil countries were considered.

Agbloyor, Abor, Adjasi, and Yawson (2014) using data on 14 African countries from 1990-2007 reported that in the absence of a well-developed financial market, private debt flows are likely to be misallocated and have a negative effect on growth. The negative effect was rationalized due to the possibility that foreign private lenders lending to African firms could be exposed to higher levels of information asymmetry. Using two-stage least square and system GMM estimation techniques for 14 sub-Saharan African countries from 1990-2013, Alley (2015) found that bank lending flows adversely impact the economy.

Owen and Temesvary (2014) found that the effect of bank finance on growth and the impact of foreign bank involvement depended on the degree of banking sector development. In countries with a more developed banking sector, domestic lenders had a greater positive impact while the impact of foreign influence was insignificant. However, in countries with a less developed banking sector, the impact of foreign lenders relative to local lenders was more detrimental to growth. Using bank lending data from the BIS Locational Banking Statistics, Yoon and Kim (2015) found that foreign bank loans resulted in a higher GDP growth rate than expected in emerging market economies.

Recent contributions in the literature have investigated the effects of private capital flow shocks on growth. Alley (2015) found that beside bank lending flows negatively impacting on growth, bank lending flow shocks further weakened growth in sub-Saharan Africa. Alley and Poloamina (2015) evaluated the effect of shocks on the macroeconomic performance of 14 sub-Saharan African countries from 1980-2012. It was found that shocks to gross inflows of bank lending per capita reduced growth.

In summary, mixed evidence is found regarding the influence of cross-border bank lending on economic growth while little empirical studies have investigated the impact of cross-border bank lending volatility on economic growth. In addition, there is an absence of studies that have captured the influence of bank deposit flows on growth. This study explores the gap in the literature regarding the link between cross-border banking volatility (loans and deposits) and economic growth for sub-Saharan African countries at a macroeconomic level.

5.3 Methodology

5.3.1 Data

This study follows Kleimeier et al. (2013) and defines cross-border banking as the practice where a bank in one country extends a loan or receives a deposit from a customer who resides in a different country. Therefore, the definition is based on residency, and not on the bank or customer's nationality. The BIS Locational Banking Statistics cover banks' global financial assets and liabilities based on the reporting entity's residence. Locational Banking Statistics' methodology is consistent with the principles used when compiling national accounts and balance of payments statistics (Takáds, 2010; Bruno & Shin, 2013). Consolidated Banking Statistics report international claims that include local claims in foreign currency which are not directly relevant to balance of payment financing.

In contrast to the consolidated data sets, locational claim changes are also available in currency adjusted form. Following Kleimeier et al. (2013), to eliminate exchange rate valuation effects, the annual exchange rate adjusted stocks are calculated where the initial nominal stock (fourth quarter of 1995) is taken with the BIS quarterly exchange rate adjusted flows being added successively. Figure 5.1 depicts the time profile of cross-border bank lending and depositing to 41 sub-Saharan African countries from 1995-2012. Mauritius was excluded as an offshore banking centre.

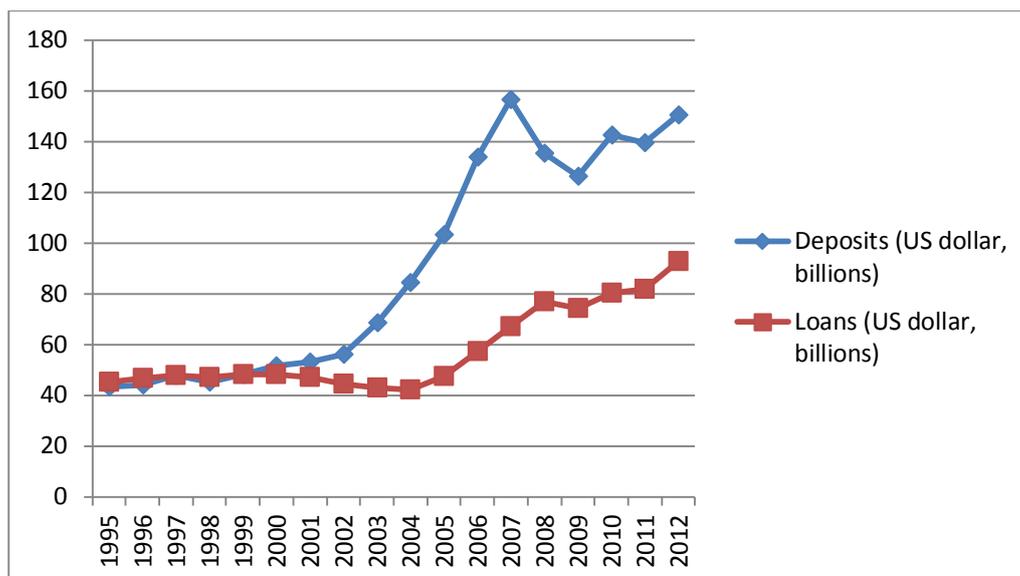


Figure 5.1: Cross-border banking to sub-Saharan Africa: 1995-2012

Source: BIS Locational Banking Statistics (2014)

From Figure 5.1 it can be seen that cross-border bank lending and deposits to sub-Saharan Africa remained fairly constant up to the turn of the century. In 1999, US\$48.18 billion was recorded for cross-border bank lending while US\$48.38 billion was recorded for deposits. After decreasing from 2001-2004, cross-border bank lending has increased to US\$92.68 billion by 2012. There was a slight decrease in cross-border bank lending activity from 2008-2009. The increase in cross-border bank deposits during the first half of the 2000s was more pronounced, with US\$156.70 billion recorded in 2007. From 2007-2009, a much greater decrease is apparent, perhaps due to the global financial crisis. However, cross-border bank deposits increased again to US\$150.54 billion in 2012. A clear trend seen in Figure 5.1 is that deposits growth has outstripped that of loans in cross-border banking.

For cross-border bank lending, the leading recipient countries in sub-Saharan Africa for 2012 were South Africa (US\$26.83 billion), Liberia (US\$26.08 billion), Nigeria (US\$9.16 billion), Angola (US\$9.14 billion) and Ghana (US\$3.90 billion). Regarding cross-border bank deposits, the leading recipient countries in sub-Saharan Africa for 2012 were South Africa (US\$30.41 billion), Nigeria (US\$26.63 billion), Angola (US\$26.15 billion), Liberia (US\$13.13 billion) and Kenya (US\$9.07 billion).

5.3.2 Cross-border banking volatility

This study follows the procedure in Broto, Diaz-Cassou, and Erce (2011) and Lee, Park, and Byun (2013) to compute cross-border banking volatility. As in Broto et al. (2011) and Lee et

al. (2013), the standard deviation of capital flows in a rolling window, σ_{it} , is expressed as follows:

$$\sigma_{it} = \left(\frac{1}{n} \sum_{k=t-(n-1)}^t (\text{flow}_{ik} - \mu)^2 \right)^{\frac{1}{2}} \quad (5.6)$$

where $\mu = \frac{1}{n} \sum_{k=t-(n-1)}^t \text{flow}_{ik}$, and flow_{ik} represents cross-border bank lending or cross-border bank deposits relative to GDP respectively for country i in period k .

This study follows Lee et al. (2013) and first normalizes the size of the flows in each of the rolling windows. Because the standard deviation indicates dispersion from the mean, greater cross-border banking flows (and hence greater means) might well exaggerate the volatility size over time if not normalized. Figure 5.2 shows the time profile of the volatility of cross-border banking from 1996 to 2011. The first three-year rolling window is from 1995-1997 and the midpoint, i.e. 1996, is then the first volatility measure.

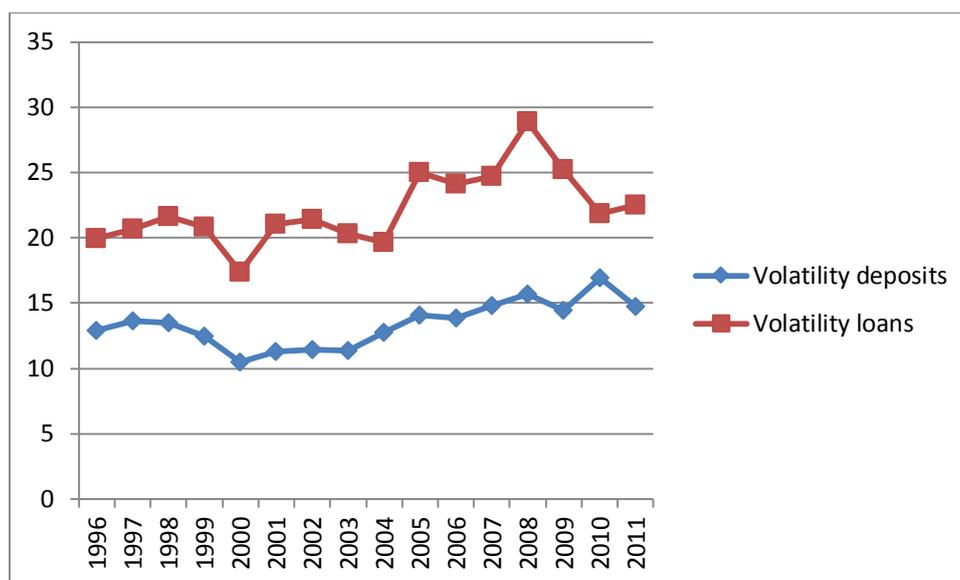


Figure 5.2: Volatility of cross-border banking to sub-Saharan Africa: 1996-2011

Source: Calculated from BIS Locational Banking Statistics (2014)

Note: The scale of the vertical axis is the calculated volatilities computed as the standard deviation of cross-border banking flows in three-year overlapping rolling windows with capital flow sizes first normalized.

Figure 5.2 indicates that the average volatility of cross-border bank lending has been continuously higher than the average volatility of deposits. The average volatility of cross-

border bank lending has rarely been stable at the aggregate level. Cross-border bank lending volatility peaked during 2008, possibly as a result of the global financial crisis. For cross-border bank deposits, volatility on average has increased more steadily compared to lending since 2000. From 2009-2011, a less stable trend is evident. For the full period, average cross-border bank lending volatility ranged from a low of 7.9 in South Africa to 38.9 in Comoros. Average cross-border bank deposit volatility ranged from a low of 5.5 in Kenya to 35.3 in Lesotho.

5.3.3 Empirical model

To estimate the effect of cross-border banking and cross-border banking volatility on economic growth, this study uses a modified version of the model used by Brambila-Macias et al. (2011) and Agbloyor et al. (2014). The following dynamic model is specified:

$$GDP_{it} = \gamma GDP_{i,t-1} + \beta_1 CROSSBANK_{it} + \beta_2 VOLCROSSBANK_{it} + \gamma X'_{it} + \varepsilon_{it} \quad (5.7)$$

X_{it} represents a vector of control variables as standard determinants of economic growth: inflation, trade openness, gross capital formation, private sector credit and institutional quality. The variables are defined as follows:

GDP_{it} = GDP (constant 2005 US\$) (log) of country i at year t .

$CROSSBANK_{it}$ = Either cross-border bank lending/GDP or cross-border bank deposits/GDP of country i at year t .

$VOLCROSSBANK_{it}$ = Volatility of cross-border lending/volatility of cross-border deposits measured as the standard deviation of cross-border lending or cross-border deposits/GDP in three-year overlapping rolling windows of country i at year t .

$INFLATION_{it}$ = Consumer price index (log) (2010=100) of country i at year t .

$TRADE OPENNESS_{it}$ = Trade/GDP of country i at year t .

$GROSS CAPITAL FORMATION_{it}$ = Gross capital formation (formerly gross domestic investment)/GDP of country i at year t .

$PRIVATE SECTOR CREDIT_{it}$ = Private credit by deposit money banks and other financial institutions/GDP of country i at year t .

$INSTITUTIONAL QUALITY_{it}$ = Institutional quality of country i at year t .

A further description of the variables and their data sources appear in Appendix 5.A.

Theoretical underpinning

The empirical model is motivated by justifying the choice of the explanatory variables. Both cross-border banking (loans or deposits) and cross-border banking volatility is included in the same empirical model as the variables could impact differently on economic growth.

Private capital flows can positively impact growth by increasing the domestic investment rate, through spurring investment associated with positive spill overs, and by leading to increased domestic financial intermediation (Bailliu, 2000). However, capital flows must finance investment and not consumption or speculative investment while also not crowding out locally financed investment. Empirically, Brambila-Macias et al. (2011) found that cross-border bank lending positively impacted on growth for African countries, while Alley (2015) found that bank lending reduced growth in sub-Saharan Africa. The link between cross-border banking and economic growth is, therefore, a priori unclear.

Increasing capital flow volatility could result in excess exchange rate volatility that increases inflation uncertainty and encourages speculative financial investment by financial and real sector firms (Demir, 2009). Empirically, Alley and Poloamina (2015) found that shocks to bank lending reduced growth in sub-Saharan Africa. This study, therefore, expects a negative relationship between cross-border banking volatility and economic growth.

High inflation would impact adversely on economic growth by creating distortions such as an increase in volatility and uncertainty that would result in a shift to less productive activities (Bittencourt, 2012). Therefore, a negative relationship between inflation and economic growth is expected.

Endogenous growth theories do not necessarily predict that trade openness would lead to higher economic growth for all countries under all circumstances (Eris & Ulasan, 2013). Empirically, Brambila-Macias et al. (2011) reported that trade openness was an important driver of economic growth in Africa, while Ahmed (2013) found that trade openness negatively contributed to economic growth in sub-Saharan Africa. The link between trade openness and economic growth is, therefore, a priori unclear.

Adams (2009) found a significant positive link between gross domestic investment and economic growth in sub-Saharan African countries, and a positive relationship with growth is a priori also expected.

The domestic financial system could positively impact economic growth through increasing the productivity of capital, the saving rate and the proportion of savings channelled to investment (Aziakpono, 2011). However, empirical evidence regarding the impact of financial development on economic growth remains mostly inconclusive (Aziakpono, 2011; Anderson, Jones, & Tarp, 2012). Results from Agbloyor et al. (2014) suggest that financial development spurs economic growth in Africa, while Menyah, Nazlioglu, and Wolde-Rufael (2014) rejected the finance-led growth hypothesis for the overwhelming number of sub-Saharan African countries in their sample. The link between private sector credit and economic growth is, therefore, a priori unclear.

Agbloyor et al. (2014) indicated that institutions positively impact economic growth in Africa and a positive link with growth a priori is similarly expected. Following Agbloyor et al. (2014), the civil liberties index from Freedom House is used as an institutional quality indicator. The sub-categories of the index permit freedom of expression and belief, associational and organisational rights, and the rule of law, as well as personal autonomy and individual rights. Because the index ranges from 1 to 7, with 1 indicating the highest civil liberties, a negative relation between the index and economic growth has to be hypothesized.

5.3.4 Estimation technique

Capital, such as bank flows, is likely to flow to countries experiencing high growth rates (Kleimeier & Versteeg, 2010). To take into consideration the possible endogeneity of the explanatory variables, the Generalized Method of Moments (GMM) estimation technique employing the Arellano and Bover (1995) method covering the period 2000-2011 is employed. This method is suitable for panels with gaps, a feature of most sub-Saharan African panel sets. Sample countries are provided in Appendix 5.B.

5.4 Results and discussion

Table 5.1: Cross-border banking, cross-border banking volatility and economic growth: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.012***(0.004)	1.009***(0.005)
Cross-border - loans	0.001(0.001)	n/a
Cross-border volatility - loans	0.001(0.001)	n/a
Cross-border - deposits	n/a	0.002***(0.001)
Cross-border volatility - deposits	n/a	0.001(0.001)
CPI (log)	-0.047**(0.019)	-0.030(0.025)
Trade openness	-0.001***(0.001)	-0.001***(0.001)
Gross capital formation	0.001***(0.001)	0.001***(0.001)
Private sector credit	-0.001(0.001)	-0.001(0.001)
Institutional quality	-0.007**(0.004)	-0.008**(0.003)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.713	0.303
2nd order autocorrelation: <i>p</i> -value	0.201	0.171
Observations	383	383
Countries	39	39

Note: The dependent variable is GDP (constant 2005 US\$) (log).

Model 1 presents the impact of cross-border bank lending and its volatility on economic growth.

Model 2 presents the impact of cross-border bank deposits and its volatility on economic growth.

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively, with standard errors in parentheses.

Table 5.1 presents the main results. The lagged values of the dependent variables for both models are statistically significant, indicating a high level of persistency in economic growth. In this study, it had been hypothesized that cross-border banking volatility will negatively impact economic growth. No evidence is found that either cross-border bank lending volatility or cross-border bank deposit volatility influence economic growth. With banking sector development in sub-Saharan Africa relatively shallow, it would appear that shocks to cross-border banking flows are not transmitted to the real economy through financial intermediation. The private sector credit coefficients are insignificant in both models.

Contrary to the findings of Brambila-Macias et al. (2011) and Alley (2015), no relationship is found between cross-border bank lending and economic growth. However, a positive link between cross-border bank deposits and economic growth is found. Deposits are largely customer-driven, and banks have little incentive to reject deposits whereas information asymmetries may impact on the supply of cross-border bank loans (Kleimeier et al., 2013).

Inflation, as a proxy for macroeconomic instability, is negatively related to economic growth as expected in Model 1. Greater macroeconomic instability is therefore negatively associated with economic growth. Trade openness is found to be negatively related to economic growth. This is in line with Ahmed (2013) who found that trade openness negatively contributed to economic growth in sub-Saharan Africa. This finding also supports previous literature that developing countries may benefit from trade restrictions under certain conditions (Yanikkaya, 2003).

As expected, gross capital formation is significantly positively related to economic growth. Adams (2009) also found a significant positive link between gross domestic investment and economic growth in sub-Saharan African countries. The results also suggest that institutions positively impact on economic growth. The negative relation suggests that countries with stronger institutions (and lower index values) experience higher economic growth. Agbloyor et al. (2014) also provided evidence that institutions play a positive role in spurring economic growth in Africa.

The post-estimation diagnostics are as expected in all models, with the Sargan test of over-identification failing to reject the null hypothesis that the over-identification restrictions are valid. Regarding the Arellano and Bond GMM procedure that tests for the first order and second order serial correlation in the disturbances, the null hypothesis of the absence of first order serial correlation should be rejected, while one should not reject the absence of second order serial correlation (Baltagi, Demetriades, & Law, 2009).

5.4.1 Cross-border banking volatility and economic growth in resource-rich developing countries (RRDCs)

RRDCs such as Angola, Liberia, and Nigeria have become some of the main cross-border banking recipient countries in sub-Saharan Africa. While Brambila-Macias et al. (2011) found that cross-border bank lending positively impacted on economic growth in Africa, the effect became negative when their sample was restricted to oil countries. This study, therefore, re-

estimates the models by limiting the samples to RRDCs. Following IMF (2012), RRDCs were selected based on the following criteria:

- Using 2010 GNI per capita, the countries must be either classified as low- or lower-middle-income countries; and
- Using average data from 2006-2010, at least 20% of total exports were natural resources. Alternatively, the countries derived at least 20% of their revenue from natural resources.

Sample countries are provided in Appendix 5.B.

Table 5.2: Cross-border banking, cross-border banking volatility and economic growth in RRDCs: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.030***(0.010)	1.079***(0.031)
Cross-border - loans	0.002(0.001)	n/a
Cross-border volatility - loans	-0.001(0.001)	n/a
Cross-border - deposits	n/a	0.008**(0.004)
Cross-border volatility - deposits	n/a	-0.003*(0.002)
CPI (log)	0.005(0.009)	0.048(0.035)
Trade openness	-0.001(0.001)	0.001(0.001)
Gross capital formation	0.002**(0.001)	0.003***(0.001)
Private sector credit	-0.004***(0.001)	-0.008**(0.004)
Institutional quality	-0.021***(0.007)	-0.034***(0.013)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.919	0.857
2nd order autocorrelation: <i>p</i> -value	0.107	0.137
Observations	141	141
Countries	15	15

Note: The dependent variable is GDP (constant 2005 US\$) (log).

Model 1 presents the impact of cross-border bank lending and its volatility on economic growth.

Model 2 presents the impact of cross-border bank deposits and its volatility on economic growth.

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively with standard errors in parentheses.

Table 5.2 presents the results for RRDCs. The lagged values of the dependent variables for both models are statistically significant, indicating a high level of persistency in economic

growth. Similar to the main results, no link is found between cross-border bank lending volatility and economic growth in RRDCs. This is contrary to the findings of Brambila-Macias et al. (2011) who reported a negative relationship between cross-border bank lending and growth when their sample was restricted to oil countries. However, evidence is found of a statistically significant and negative relationship between cross-border bank deposit volatility and economic growth for RRDCs. The negative effect of cross-border bank deposit volatility on growth could be due to the notion that increased bank deposit flow volatility increases uncertainty that encourages speculative financial investment and in turn adversely affects economic growth. Also similar to the main results, this study found a positive link between cross-border bank deposits and economic growth for RRDCs.

Gross capital formation is significantly positively related to economic growth in RRDCs, similar to the results reported previously. The results for RRDCs do not support the finance-led growth hypothesis. Brambila-Macias et al. (2011) posited that because of the resource curse, oil producer countries have less incentive to invest in financial sector reforms than non-oil countries. Similar to the main results, the importance of institutions in spurring economic growth in RRDCs is confirmed.

The post-estimation diagnostics are as expected in both RRDC models. The Sargan test of over-identification fails to reject the null hypothesis that the over-identification restrictions are valid. The null hypothesis of the absence of first order serial correlation in the disturbances is rejected, while the absence of second order serial correlation in the disturbances is not rejected (Baltagi et al., 2009).

5.4.2 Robustness

Finally, to check the robustness of the results, this study re-estimated the models in two variations. The first variation has cross-border banking (loans or deposits) as one of the explanatory variables, and there is no cross-border banking volatility. The second variation has cross-border banking volatility as one of the explanatory variables, but does not have the cross-border banking variable. The results are reported in Appendix 5.C do not differ from the main results.

5.5 Conclusion

This study provides evidence that cross-border bank deposit flows contribute to economic growth in sub-Saharan Africa. Cross-border banking volatility, specifically cross-border bank deposit volatility, is detrimental to economic growth when the sample is restricted to RRDCs.

No evidence is found that cross-border bank lending is related to economic growth. The results, therefore, indicate that cross-border bank loans and deposits require a differentiated analysis.

A policy implication regarding the negative link between cross-border bank deposit volatility and economic growth is that RRDCs should have measures in place to monitor the predictability of deposit flows. This is important as the negative effects of deposit shocks could minimize the growth-enhancing benefits of bank deposits received.

Only 24% of African countries have explicit deposit insurance (Demirgüç-Kunt, Kane, & Laeven, 2014). Financial sector policymakers should investigate the feasibility of developing the region's deposit insurance to prevent bank runs associated with the volatility of cross-border banking deposits.

As opposed to other private capital flows, cross-border banking has only recently attracted attention in the empirical literature. Using a differentiated approach to investigate the determinants of cross-border bank lending and deposits to sub-Saharan African countries is a further future research avenue. A differentiated approach to examine the determinants of cross-border bank lending volatility and deposit volatility of sub-Saharan African countries is also advocated.

Appendix 5.A: Variables and data sources

GDP: GDP (log) in constant 2005 US\$ obtained from the World Bank WDI.

Cross-border banking: Either cross-border lending/GDP or cross-border bank deposits/GDP. This study follows Kleimeier et al. (2013) and defines cross-border banking as the practice where a bank in one country extends a loan or receives a deposit from a customer who resides in a different country. Data is obtained from the BIS Locational Banking Statistics.

Volatility of cross-border banking: Standard deviation of cross-border banking (lending or deposits)/GDP using three-year overlapping rolling windows with the method described in section 5.3.2.

Inflation: Consumer price index (log) (2010=100) reflects changes in the cost to the average consumer of acquiring a basket of goods and services. The series is obtained from the World Bank WDI.

Trade openness: Sum of exports and imports of goods and services measured as a share of GDP with the series obtained from the World Bank WDI.

Gross capital formation: Gross capital formation (formerly gross domestic investment) as a share of GDP consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. The series is obtained from the World Bank WDI.

Private sector credit: Private credit by deposit money banks and other financial institutions to GDP (%) with the series obtained from the World Bank Global Financial Development database.

Institutional quality: The civil liberties index from Freedom House is used as institutional quality indicator. The sub-categories of the index permit for freedoms of expression and belief, associational and organizational rights, rule of law, and personal autonomy and individual rights. The index ranges from 1 to 7, with 1 indicating the highest institutional quality.

Appendix 5.B: Sample countries

Full sample countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia.

Resource-rich developing countries (RRDCs): Angola, Cameroon, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Republic of the Congo, Sudan, Zambia.

Appendix 5.C: Robustness

Table 5.3: Cross-border banking, cross-border banking volatility and economic growth: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.012***(0.004)	1.012***(0.004)
Cross-border - loans	0.001(0.001)	n/a
Cross-border volatility - loans	n/a	0.001(0.001)
Cross-border - deposits	n/a	n/a
Cross-border volatility - deposits	n/a	n/a
CPI (log)	-0.047**(0.019)	-0.047**(0.019)
Trade openness	-0.001***(0.001)	-0.001**(0.001)
Gross capital formation	0.001**(0.001)	0.001**(0.001)
Private sector credit	-0.001(0.001)	-0.001(0.001)
Institutional quality	-0.007**(0.004)	-0.007**(0.004)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.724	0.706
2nd order autocorrelation: <i>p</i> -value	0.198	0.202
Observations	383	383
Countries	39	39

Note: The dependent variable is GDP (constant 2005 US\$) (log).

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively, with standard errors in parentheses.

Table 5.4: Cross-border banking, cross-border banking volatility and economic growth: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.012***(0.004)	1.009***(0.005)
Cross-border - loans	n/a	n/a
Cross-border volatility - loans	n/a	n/a
Cross-border - deposits	0.002***(0.001)	n/a
Cross-border volatility - deposits	n/a	0.001(0.001)
CPI (log)	-0.046**(0.019)	-0.030(0.024)
Trade openness	-0.001***(0.001)	-0.001***(0.001)
Gross capital formation	0.001***(0.001)	0.001***(0.001)
Private sector credit	-0.001(0.001)	-0.001(0.001)
Institutional quality	-0.007**(0.007)	-0.007**(0.003)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.734	0.280
2nd order autocorrelation: <i>p</i> -value	0.194	0.174
Observations	383	383
Countries	39	39

Note: The dependent variable is GDP (constant 2005 US\$) (log).

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively, with standard errors in parentheses.

Table 5.5: Cross-border banking, cross-border banking volatility and economic growth in RRDCs: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.030***(0.010)	1.005***(0.008)
Cross-border - loans	0.002(0.001)	n/a
Cross-border volatility - loans	n/a	-0.001(0.001)
Cross-border - deposits	n/a	n/a
Cross-border volatility - deposits	n/a	n/a
CPI (log)	0.004(0.004)	-0.009(0.019)
Trade openness	-0.001(0.001)	-0.001(0.001)
Gross capital formation	0.002***(0.001)	0.001(0.001)
Private sector credit	-0.004***(0.001)	-0.002(0.001)
Institutional quality	-0.021***(0.007)	-0.013**(0.006)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.921	0.996
2nd order autocorrelation: <i>p</i> -value	0.107	0.168
Observations	141	141
Countries	15	15

Note: The dependent variable is GDP (constant 2005 US\$) (log).

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively, with standard errors in parentheses.

Table 5.6: Cross-border banking, cross-border banking volatility and economic growth in RRDCs: system GMM estimation

	(1)	(2)
Lag of dependent variable (log)	1.064***(0.032)	1.095***(0.032)
Cross-border - loans	n/a	n/a
Cross-border volatility - loans	n/a	n/a
Cross-border - deposits	0.007**(0.004)	n/a
Cross-border volatility - deposits	n/a	-0.003**(0.002)
CPI (log)	0.032**(0.034)	0.048(0.032)
Trade openness	-0.001(0.001)	0.001**(0.001)
Gross capital formation	0.002**(0.001)	0.002***(0.001)
Private sector credit	-0.008*(0.001)	-0.008**(0.001)
Institutional quality	-0.035**(0.007)	-0.042**(0.006)
Sargan test for over-identifying restriction:		
<i>p</i> -value	0.996	0.922
2nd order autocorrelation: <i>p</i> -value	0.093	0.095
Observations	141	141
Countries	15	15

Note: The dependent variable is GDP (constant 2005 US\$) (log).

***, ** and * indicate the level of significance at 1%, 5%, and 10% respectively, with standard errors in parentheses.

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CHAPTER SIX

FINANCIAL OPENNESS AND OUTPUT VOLATILITY IN SUB-SAHARAN AFRICA

6.1 Introduction

This chapter examines the effect of financial openness on output volatility in African countries. Output volatility has been much higher in developing countries than in their developed counterparts (Perry, 2009; Essers, 2013). For many developing countries and regions such as sub-Saharan Africa, output volatility remains a critical topic and appears to be widespread (Malik & Temple, 2009). Negative consequences of higher output volatility identified in the literature include lower economic growth (Ramey & Ramey, 1995; Kose, Prasad, & Terrones, 2006), lower private investment (Aizenman & Marion, 1999), higher consumption volatility (Loayza, Ranci re, Serv n, & Ventura, 2007; Perry, 2009), a higher degree of income inequality (Breen & Garcia-Penalosa, 2005) and substantial costs relating to employment (Benigno & Ricci, 2011).

In recent years, economic research has started to focus on the implication of financial openness on output volatility (Popov, 2011). The sparse literature on the effects of financial openness on output volatility warrants more empirical research (Kose, Prasad, Rogoff, & Wei, 2009). There is still no consensus in the theoretical and empirical literature whether financial openness increases or reduces output volatility (Hwang, Park, & Shin, 2013; Meller, 2013). While trade openness has been promoted as being constructive for economic performance, there remains much controversy regarding the benefits of financial openness¹ (Ferreiro, Correa, & Gomez, 2009; Aizenman, Jinjarak, & Park, 2013).

At a conceptual level, financial openness involves benefits as well as costs, and on the positive side can contribute to economic growth through promoting capital accumulation and technology spill overs (Hwang et al., 2013). Countries could also smooth their consumption and engage in risk sharing, while collateral benefits include financial sector development and improvement in the quality of institutions and governance. However, financial openness limits monetary policy independence and potentially causes economic volatility (Hwang et al., 2013).

¹ As explained by Gehringer (2013), this study is part of the majority of studies from the economic community that clearly differentiates between financial liberalization and financial development, and in the present study the concepts of financial liberalization, financial integration and financial openness are used as synonyms.

Specifically, by possibly inducing more volatile capital flows and volatile interest rates, a potential cost of financial openness is exposure to crises and external shocks.

In this study, the investigation is limited to one potential cost of financial openness: output volatility. Sub-Saharan African studies that have examined the financial openness and output volatility link include the work of Ahmed and Suardi (2009). This study differs from Ahmed and Suardi (2009) in that this study specifically investigates how financial openness impacts on output volatility through the channel of volatile FDI flows. Very little attention has been directed to investigate the link between capital inflow volatility and output volatility (Federico, Vegh, & Vuletin, 2013).

According to Hwang et al. (2013) the literature has identified three main channels through which financial openness impacts output volatility: volatile capital flows, volatile real interest rates, and through financial and economic crises. This study focuses on the volatile capital flow channel, specifically the impact of FDI volatility. Because of sub-Saharan Africa's low savings and investment rates, FDI as a source of capital is extremely important compared to other capital flows (Agbloyor, Abor, Adjasi, & Yawson, 2013). Aizenman, Chinn, and Ito (2010) found that different types of external financing had different effects on output volatility. It is also widely perceived that certain types of capital flows are more desired than others (Aizenman et al., 2013). FDI is often regarded as more stable than other flows and should thus be encouraged to guarantee a less volatile level of output (Federico et al., 2013), while foreign debt has been blamed for increasing the risk of financial crises (Bordo, Meissner, & Stuckler, 2010). Countries seeking to liberalize capital flows should start with FDI inflows (IMF, 2012). Therefore, it becomes necessary to examine whether FDI inflow volatility has an effect on output volatility as well.

This study uses panel data from 34 sub-Saharan African countries from 1990 to 2011 to estimate the models. Output volatility could exhibit cross-section dependence through regional and macroeconomic linkages that arise from common global shocks (e.g. global financial crisis), shared institutions (e.g. the IMF), or from country or regional local spill overs. Standard panel estimation techniques do not necessarily produce consistent parameter estimates when the errors from a panel regression exhibit cross-section dependence (Kapetanios, Pesaran, & Yamagata, 2011). The models are estimated using the Augmented Mean Group (AMG) estimator of Eberhardt and Teal (2010) to account for cross-section dependence.

The rest of this chapter is structured as follows: Section 6.2 provides an overview of the relevant literature, Section 6.3 details the methodology employed in the empirical analysis, in Section 6.4 the results of the empirical estimations are presented and in Section 6.5 the chapter is concluded.

6.2 Overview of the relevant literature

The theoretical literature suggests that the link between financial openness and output volatility is a priori unclear (Hwang et al., 2013; Meller, 2013). Increasing financial openness could reduce macroeconomic volatility in capital-poor developing economies by providing additional sources of external finance (Kose et al., 2006). Developing economies would then be able to diversify away from limited production bases that are often agricultural or natural resource dependent, thus lowering output volatility (Kose et al., 2009). Increased financial openness may also promote institutional reforms leading to a stable financial system, thereby contributing to output stability (Mishkin, 2009).

Financial openness could also increase output volatility. Increased capital market integration could result in increased specialization (Kalemli-Ozcan, Sorensen, & Yosha, 2003). At a more advanced stage of development, middle-income countries could subsequently become more vulnerable to industry-specific shocks resulting in higher output volatility (Kose et al., 2009). If increasing capital market integration results in an over-reliance on external debt, countries will be exposed to world interest rate shocks and thus higher output volatility (Kose et al., 2009). Aghion, Bacchetta, and Banerjee (2004) introduced a framework to analyse how financial factors could lead to instability in small open economies. In an economy with a closed capital account, the response to a cash flow shock is limited given the constrained amount of capital available to finance entrepreneurs. Extra funding sources in an open economy could potentially increase the response to a shock and the potential for volatility. Aghion et al. (2004) conclude that unrestricted financial liberalization could be destabilizing for countries without a well-developed financial sector.

According to Hwang et al. (2013), the literature has identified volatile capital flows as one of the main channels through which financial openness impacts output volatility. Stiglitz (2000) already noted that the potential benefits of financial openness may be offset by capital movements that are highly pro-cyclical, thus exacerbating economic fluctuations. Kim and Singal (2000) stated that a major concern is movements due to “hot money,” i.e. flows that are highly sensitive to differences in interest rates, economic growth expectations, and expected

securities' returns. A small shock to the economy may induce volatile flows that can aggravate the shock and destabilize the domestic economy. Nevertheless, very little attention has been given to investigate the relationship between capital inflow volatility and outflow volatility (Federico et al., 2013).

Converse (2014) built a model of a small open economy where, because of financial constraints, firms that funded long-term projects with short-term debt, i.e. maturity mismatch, are prevalent. If there is uncertainty about the future availability of foreign borrowing, firms will cut long-term investment resulting in decreasing aggregate investment that would generate a decline in aggregate productivity. Capital flow volatility shocks thus amplify volatility in output and total factor productivity in economies where maturity mismatch is widespread, as in the case of emerging market economies (Converse, 2014).

Within the empirical literature, there is no consensus whether financial openness increases or decreases output volatility (Meller, 2013). A positive link between financial openness and output volatility has been reported in the literature. Hwang et al. (2013) used data from 21 advanced and 81 developing countries from 1971-2010 and reported that financial openness increased output volatility in developing countries. Hwang et al. (2013) further examined the main channels through which financial openness influences output volatility in developing countries. Their results showed that financial openness increases output volatility through a crisis episode, specifically currency and external debt crises. Another channel, volatile capital flows, did not significantly influence output volatility. Hwang et al. (2013) did not differentiate between different types of private capital flows: this could perhaps explain their non-significant finding. Aizenman et al. (2010) found that different types of private capital flows have different impacts on output volatility.

It was also argued that the indirect effects of financial openness (e.g. on financial development or institutions) might be far more important. Alternatively, a relationship does exist, but the link is non-linear or depends on some omitted variable (Meller, 2013). Bekaert, Harvey, and Lundblad (2006) found no evidence of increased output volatility after equity market liberalization. However, their results suggest that in economically fragile countries characterized by low-quality institutions and a poorly developed financial system, equity market liberalization may increase output volatility. Investigating 25 sub-Saharan African countries from 1971-2005, Ahmed and Suardi (2009) reported that financial market depth and institutional quality operated jointly with trade- and financial openness to reduce output

volatility. Aizenman et al. (2010) investigated the impact of the trilemma policy mix on the economic performance in developing countries. Their results indicated that increased financial openness, when supported by a high degree of financial development, reduce output volatility.

Some studies have found no link between financial openness and output volatility. Razin and Rose (1992) reported no significant relationship between financial openness and output volatility for 138 countries from 1950-1988. Being unable to distinguish between global or idiosyncratic, and temporary or persistent, shocks was put forward as explanation for their finding. Using data for 24 OECD countries from 1960-2000, Buch, Doepke, and Pierdzioch (2005) found no stable relationship between financial openness and output volatility. Their results suggest that the link between macroeconomic policy, financial openness, and output volatility has changed over the years. Kose et al. (2009) summarized that existing research using different regression models, country samples, and time periods lead to the conclusion that no systematic link between financial openness and output volatility exists.

6.3 Methodology

6.3.1 Data

Various measures of formal-political (de jure) and actual (de facto) financial openness have been employed in the related literature. Gehringer (2013) notes that it has become common practice for most of the recent contributions to the field to distinguish between de jure and de facto indicators. De jure indicators are concerned with the presence or not of legal restrictions on capital transactions, while de facto indicators measure flows or stocks of foreign assets and/or liabilities. Therefore, it is not certain that a formal financially open economy is practically so and vice versa (Gehringer, 2013).

This study employs a de facto financial openness indicator. Although both de jure and de facto indicators contain valuable information, de facto indicators could provide a clearer picture of an economy's financial integration and in many empirical cases is more suitable (Kose et al., 2009). Financial liberalization remains an incomplete and ongoing process in sub-Saharan Africa (Misati & Nyamongo, 2012; Ahmed, 2013) and, therefore, materializes gradually. Further, de jure indicators being categorical variables are often time-invariant.

As indicator of de facto financial openness, this study uses the "External Wealth of Nations Mark II" database (updated) of Lane and Milesi-Ferretti (2007) that measures the stocks of foreign assets and liabilities. The use of stock figures is preferable to the use of flow data as annual gross flows are volatile and open to measurement error, while for risk-sharing purposes

stock measures are also more suitable (Kose et al., 2009). Other financial openness studies that have employed this database include Hwang et al. (2013) and Popov (2011). Following Lane and Milesi-Ferretti (2007), the de facto financial openness indicator was calculated using the ratio of $\frac{(FAit+FLit)}{GDPit}$ with FA (FL) denoting the stock of external assets (liabilities): Figure 6.1 plots this ratio for sub-Saharan African countries over 1990-2011.

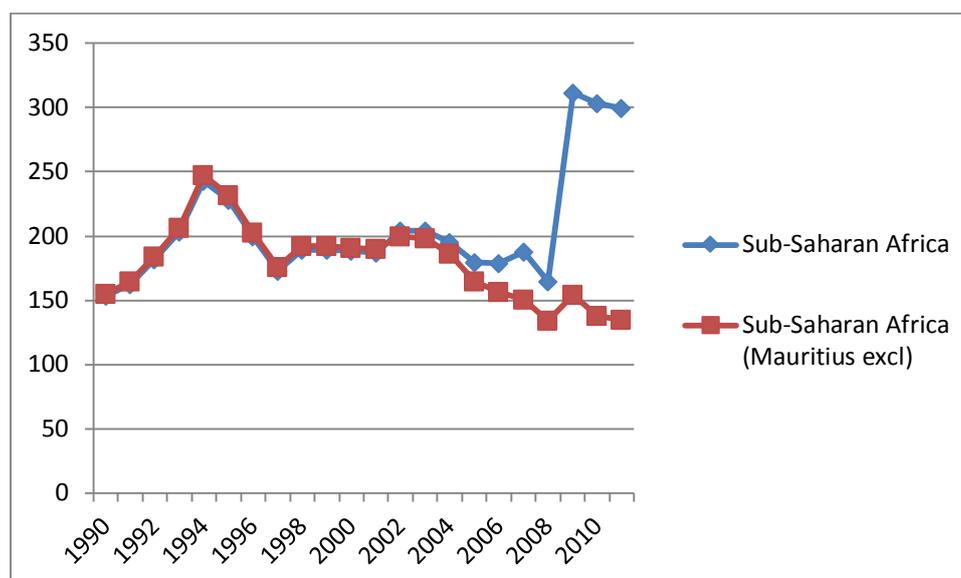


Figure 6.1: Ratio of sum of foreign assets and foreign liabilities to GDP for sub-Saharan Africa, 1990-2011

Source: Lane and Milesi-Ferretti database (2007) (updated)

Note: The scale of the vertical axis is the Lane and Milesi-Ferretti (2007) calculated de facto financial openness indicator using the ratio of $\frac{(FAit+FLit)}{GDPit}$ with FA (FL) denoting the stock of external assets (liabilities).

From Figure 6.1 it can be seen that when Mauritius, as an offshore banking centre, is excluded from the analysis the degree of financial openness in sub-Saharan Africa since 1990 has been disappointing. As of 2011, the ratio is even lower than 150% which was the approximate ratio in 1990. After the ratio remained fairly stable from 1998-2004, a gradual decrease is apparent. Excluding Mauritius, the five highest recorded ratios as of 2011 were in Liberia (435%), Seychelles (419%), Sao Tome and Principe (251%), Lesotho (226%) and Mauritania (208%). The lowest recorded ratios as of 2011 were in Cameroon (51%), Ethiopia (53%), Malawi (54%), CAR (70%) and Rwanda (72%).

To calculate output volatility, this study follows Jetter (2014) and uses the Hodrick-Prescott (HP) filter to detrend annual country growth rates. Backus and Kehoe (1992) suggest that for annual data the benchmark value of $\lambda_{HP} = 100$ should be applied to adjust for the sensitivity of the trend portion. After applying the HP filter, an annual cycle term is obtained for each country. As output volatility, in general, is the concern, and not just positive or negative deviations from the trend, this study follows Jetter (2014) and squares the cycle term to obtain a measurement for the annual volatility component of a country's growth rate. This value is subsequently divided by 100 to facilitate comparability.

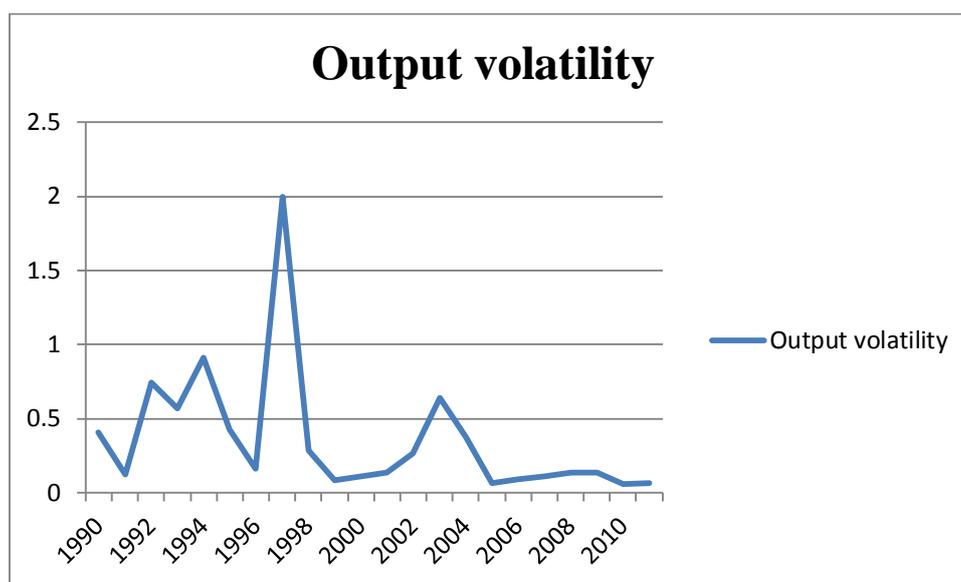


Figure 6.2: Output volatility for sub-Saharan Africa, 1990-2011

Source: Calculated from WDI (2016)

Note: The scale of the vertical axis is the calculated output volatility. The HP filter is used to obtain an annual cycle term that is squared and divided by 100 to facilitate comparability.

From Figure 6.2 it can be seen that for the period under review average output volatility for 45 sub-Saharan African countries peaked during 1997. Since 2005, lower average values compared to the average values of 1990-2011 have been recorded. For the whole period under review, Liberia (6.427), Rwanda (1.842), Mauritania (0.784), Chad (0.668) and Angola (0.561) had the highest average output volatility. The lowest average output volatility was recorded in Guinea (0.014), Tanzania (0.016), Ghana (0.023), Lesotho (0.026) and Mauritius (0.027). Figure 6.3 shows preliminary evidence regarding the link between financial openness and

output volatility that suggests increased financial openness is associated with higher output volatility.

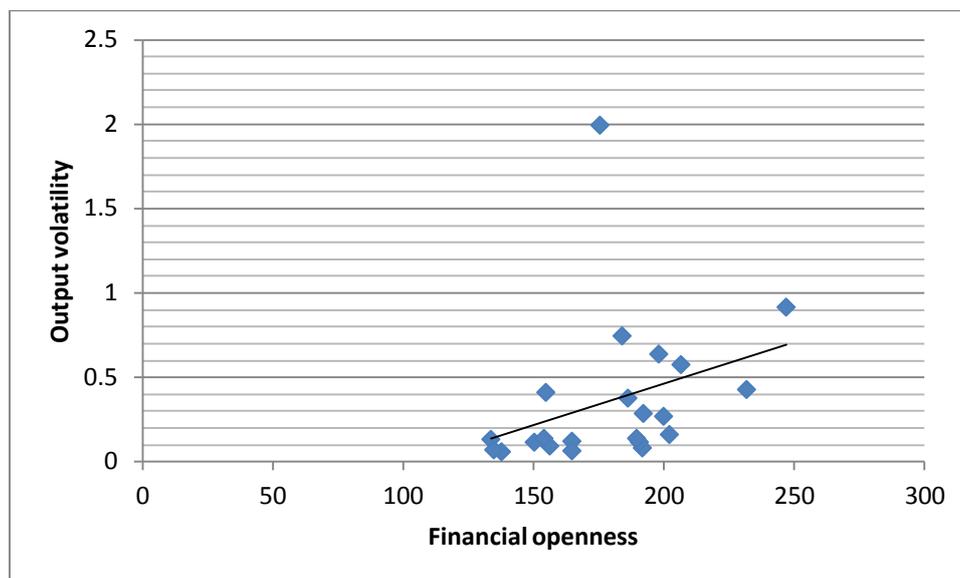


Figure 6.3: Scatterplot of average output volatility and average financial openness

Source: Calculated from WDI (2016) and Lane and Milesi-Ferretti database (2007) (updated)

Note: The scale of the vertical axis is the calculated output volatility. The HP filter is used to obtain an annual cycle term that is squared and divided by 100 to facilitate comparability. The scale of the horizontal axis is the calculated de facto financial openness indicator using the ratio of $\frac{(FA_{it}+FL_{it})}{GDP_{it}}$ with FA (FL) denoting the stock of external assets (liabilities).

The focus in this chapter is also on whether financial openness impact output volatility through the channel of volatile capital flows, specifically FDI volatility. The focus is on net FDI flows while acknowledging that this focus reflects the joint behaviour of foreign and domestic agents that could have different motivations and incentives. The focus is largely driven by the availability of data. To compute volatility, this study calculates the standard deviation of FDI flows using three-year overlapping rolling windows. Following Broto, Diaz-Cassou, and Erce (2011) and Lee, Park, and Byun (2013) the standard deviation of FDI flows in a rolling window, σ_{it} , is expressed as follows:

$$\sigma_{it} = \left(\frac{1}{n} \sum_{k=t-(n-1)}^t (\text{flow}_{ik} - \mu)^2 \right)^{\frac{1}{2}} \quad (6.1)$$

where $\mu = \frac{1}{n} \sum_{k=t-(n-1)}^t \text{flow}_{ik}$, and flow_{ik} represents the FDI flows relative to GDP for country i in period k .

An increase in FDI flows would inflate the volatility size over time because the standard deviation indicates dispersion from the mean. Therefore, this study follows Lee et al. (2013) and first normalizes the size of the FDI flows in each of the rolling windows.

6.3.2 Model specification

Following the model adapted from Coric and Pugh (2013) the empirical model is specified as:

$$\begin{aligned}
 Y_{it} = & \beta_0 + \beta_1 \text{FINOPEN}_{it} + \beta_2 \text{FDIVOL}_{it} + \beta_3 \log \text{CPI}_{it} + \beta_4 \text{GOV}_{it} \\
 & + \beta_5 \text{TOTVOL}_{it} + \beta_6 \text{TO}_{it} + \beta_7 \text{GDPPC}_{it} + \beta_8 \text{PVTC}_{it} \\
 & + \beta_9 \text{POLR}_{it} + \varepsilon_{it}
 \end{aligned} \quad (2)$$

With the variables defined as follows:

Y_{it} = Output volatility using the HP filter with $\lambda_{\text{HP}} = 100$ for detrending growth rates of country i at year t .

FINOPEN_{it} = De facto financial openness indicator, i.e. stocks of foreign assets and liabilities/GDP of country i at year t .

FDIVOL_{it} = Volatility of FDI flows measured as the standard deviation of capital inflows in three-year overlapping rolling windows of FDI inflows/GDP of country i at year t .

$\log \text{CPI}_{it}$ = Consumer price index (log) (2010=100) of country i at year t .

GOV_{it} = Government final consumption expenditure (% of GDP) of country i at year t .

TOTVOL_{it} = Terms of trade volatility measured as the standard deviation of terms of trade index (2000=100) of country i at year t .

TO_{it} = Trade/GDP of country i at year t .

GDPPC_{it} = GDP per capita (constant 2005 US\$) of country i at year t .

PVTC_{it} = Private credit by deposit money bank other financial institutions/GDP of country i at year t .

POLR_{it} = Political rights of country i at year t .

A further description of the variables and their data sources appear in Appendix 6.A.

Following Adjasi, Abor, Osei, and Nyavor-Foli (2012), who argue that the effect of FDI on output depends on the local financial market, this study also estimates a second equation to capture the effect of the interaction of FDI volatility and financial openness on output volatility:

$$\begin{aligned}
 Y_{it} = & \beta_0 + \beta_1 FINOPEN_{it} + \beta_2 (FINOPEN_{it} * FDIVOL_{it}) + \beta_3 \log CPI_{it} \\
 & + \beta_4 GOV_{it} + \beta_5 TOTVOL_{it} + \beta_6 TO_{it} + \beta_7 GDPPC_{it} \\
 & + \beta_8 PVT C_{it} + \beta_9 POLR_{it} + \varepsilon_{it}
 \end{aligned} \tag{6.3}$$

where β_2 , in this instance, represents the interactive effect between FDI volatility and financial openness.

6.3.3 Theoretical underpinning of the model

The theoretical literature suggests that the link between financial openness and output volatility is a priori unclear. Within the empirical literature, there is also no consensus on whether financial openness increases or decreases output volatility (Meller, 2013). The a priori expectation for the expected coefficient for financial openness can, therefore, be either positive or negative.

The logarithm of the CPI index is used to capture the effect of inflation on output volatility. Summers (2005) argues that through achieving low and stable inflation, monetary policy could contribute to an environment conducive to more stable output growth. This can be achieved through lower inflation that reduces nominal distortions (e.g. from taxation), thereby eliminating a source of uncertainty regarding firms' investment decisions. Policy makers might thus have more flexibility in using monetary policy to respond to a crisis. Therefore, a positive coefficient is hypothesized for inflation. According to Meller (2013), high government expenditures could be a sign of macroeconomic imbalances signifying poor fiscal policy and increasing output volatility. A positive coefficient for government final consumption expenditure is therefore expected.

Supply-side shocks are proxied by the standard deviation of the terms of trade index. According to Malik and Temple (2009), it is well known that a positive link exists between output volatility and terms of trade volatility. Terms of trade volatility are also strongly associated with a lack of export diversification, and countries that specialize in a narrow range of exports are vulnerable to fluctuations in world prices. A positive coefficient for terms of trade volatility

is therefore expected. Trade openness' effect on output volatility is controversial (Meller, 2013). Di Giovanni and Levchenko (2009) found that sectors more open to trade are more volatile and that more trade results in increased specialization. Together, these forces imply increased output volatility. Cavallo (2008) provided evidence of a negative relationship between trade openness and output volatility. It was further stated that this result is consistent with the financial fragility literature where trade openness reduces vulnerability to certain forms of financial crises and smooths the adjustment in the aftermath of shocks. The a priori expectation for the expected coefficient for trade openness can, therefore, be either positive or negative.

The level of economic development is proxied by real per capita GDP. Poor countries specialize in more volatile sectors and experience more frequent and severe aggregate shocks (Koren & Tenreyro, 2007). A negative coefficient for GDP per capita is therefore expected. Financial development may dampen output fluctuations by allowing for diversification as well as reducing information asymmetries in financial markets (Malik & Temple, 2009). Therefore, private credit is expected to have a negative coefficient. Finally, this study controls for the possible effect of political instability on output volatility by including the Political Rights Index from Freedom House. The sub-categories of the index permit for the electoral process, political pluralism and participation, and functioning of government. To obtain general political backing for policy decisions in democracies implies that risky policies are less frequent than under autocratic rule (Malik & Temple, 2009). Therefore, more democracy or political rights may be associated with less variable outcomes. Because the index ranges from 1 to 7, with 1 indicating the highest political rights, a positive relationship between the index and output volatility is hypothesized.

6.3.4 Estimation technique

Panel regressions are estimated using macro-level data for 34 sub-Saharan African countries from 1990 to 2011. The specific countries appear in Appendix 6.B. Given the nature of the panel, large N and large T, this study tests for cross-section dependence as well as unit roots. Pesaran's (2004) cross-section dependence test (CD) and Pesaran's (2007) CIPS ($Z(t\text{-bar})$) test for unit roots, which also caters for cross-section dependence, were employed. The CIPS tests were estimated with a constant term and trend while the Im, Pesaran, and Shin (2003) (IPS) panel unit root test was first run on each series using an AIC automatic lag selection process to identify the number of lags to be used for the CIPS tests. Table 6.1 reports the tests for cross-section dependence and unit roots.

Table 6.1: Tests for cross-section dependence and unit roots

Variable	CD-test	p-value	Corr	Abs(corr)	CIPS	p-value
Output volatility	2.99	0.003	0.026	0.170	-5.450	0.000
Financial openness	26.12	0.000	0.228	0.432	2.795	0.997
FDI volatility	19.21	0.000	0.171	0.316	-3.201	0.001
Log CPI	103.66	0.000	0.931	0.931	0.051	0.520
Government expenditure	2.86	0.004	0.026	0.320	1.050	0.853
TOT volatility	1.42	0.156	0.014	0.395	-4.855	0.000
Trade openness	19.56	0.000	0.172	0.367	0.342	0.634
GDP per capita	34.35	0.000	0.300	0.637	2.736	0.997
Private credit	27.15	0.000	0.258	0.469	-2.145	0.016
Political rights	n/a [#]	n/a [#]	n/a [#]	n/a [#]	-2.388	0.008

Note: # indicates that the panel is unbalanced with not enough common observations across the panel to perform Pesaran's (2004) test.

Table 6.1 shows that eight out of ten variables exhibit cross-section dependence while five out of ten variables contain unit roots. Clearly there is a need to account for the cross-section dependence and non-stationarity in the panel. The recent non-stationary panel literature has focused on allowing general cross-section dependencies among panel members (Pedroni, Vogelsang, Wagner, & Westerlund, 2015). To account for this, models are estimated using the AMG estimator of Eberhardt and Teal (2010), a technique that caters for residual cross-section dependence as well as non-stationary residuals. Standard panel estimation techniques (e.g. pooled OLS, fixed- or random-effects, or GMM) do not necessarily produce consistent parameter estimates when the errors from a panel regression exhibit cross-section dependence (Kapetanios et al., 2011).

6.4 Results and discussion

Table 6.2: *Financial openness and output volatility: The role of FDI volatility. Augmented Mean Group (AMG) estimator*

	Output volatility (1)	Output volatility (2)
Financial openness	0.0021**(0.0010)	0.0021*(0.0011)
FDI volatility	-0.0004(0.0012)	n/a
Interaction term	n/a	-0.0001(0.0001)
Log CPI	-0.2579(0.2108)	-0.2248(0.2157)
Government expenditure	0.0095(0.0070)	0.0120*(0.0069)
TOT volatility	-0.0029(0.0066)	-0.0031(0.0062)
Trade openness	-0.0141*(0.0074)	-0.0146*(0.0078)
GDP per capita	-0.0036*(0.0022)	-0.0038*(0.0022)
Private credit	0.0231(0.0281)	0.0253(0.0302)
Political rights	0.0043(0.0396)	-0.0093(0.0423)
RMSE	0.2731	0.2714
Observations	669	669
Countries	34	34
CD	0.218	0.175
CIPS	0.000	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p values.

In model 2, financial openness interacts with FDI volatility.

Table 6.2 presents the results. In model 1, FDI volatility is included as an explanatory variable. In model 2, to account for the possibility that FDI volatility may not have an independent impact on output volatility, an interaction term between financial openness and FDI volatility is specified. When FDI volatility and the interaction term is included in the same model, no clear insights of the determinants of output volatility is found given no significant factors. Subsequently, results from this model are not presented in Table 6.2.

In both models, financial openness is significantly positively related to output volatility. Financial openness could increase output volatility due to the movement of “hot money” (Meller, 2013). These flows are sensitive to interest rate differentials, future economic growth expectations, and expected security returns. Because of the sensitivity of these flows, a small shock to the economy can lead to volatile flows that exacerbate the shock and destabilize the local economy (Kim & Singal, 2000). Substantial reliance on external debt also exposes domestic economies to world interest rate shocks and, thus, higher output volatility (Kose et al., 2009).

Maturity mismatch is widespread in developing economies. Converse (2014) demonstrated that maturity mismatch is an important channel through which uncertainty shocks impact the real economy. Because of financial frictions, firms are forced to rely on short-term debt that entails rollover risk for long-term investment. Rollover risk is increased with greater uncertainty regarding the future availability of borrowing, and long-term investment is cut back depressing aggregate demand and total factor productivity. As a consequence, capital flow volatility amplifies macroeconomic fluctuations in developing economies because firms cannot finance long-term projects without engaging in maturity mismatch (Converse, 2014). The findings are in line with Hwang et al. (2013) who report that financial openness increases output volatility in 81 developing countries.

FDI volatility is not significant in explaining output volatility. In model 2, the interaction term between financial openness and FDI volatility is not significant as well. This suggests that the extent to which financial openness increases output volatility does not depend on the degree of FDI volatility. Hwang et al. (2013) report that while financial openness increases output volatility, it also does not depend on the degree of capital flow volatility.

In both models, trade openness is significantly negatively related to output volatility. This can be explained that for sub-Saharan African countries, trade openness reduces the vulnerability to certain forms of financial crises and smooths the adjustment in the aftermath of shocks (Cavallo, 2008). GDP per capita is also significantly negatively related to output volatility in both models, as expected. The level of economic development is, therefore, an important factor in reducing output volatility in sub-Saharan Africa. Ahmed and Suardi (2009) also provide evidence that the degree of economic development is negatively related to output volatility in sub-Saharan Africa. In model 2, government expenditure is significantly positively related to output volatility. This result is in line with Meller’s (2013) finding that large government

spending could be a sign of macroeconomic imbalances or wastefulness that could destabilize an economy.

The CD and CIPS tests of the residuals also show that the models are devoid of any cross-section dependence and non-stationarity problems.

6.4.1 Robustness

The samples are split according to country income groups per World Bank classification. This process allows us to ascertain if the impact of financial openness on output volatility differs for middle-income countries (MICs) and low-income countries (LICs). The results appear in Appendices 6.C and 6.D. The CD test reveals that for the second LIC model, cross-section dependence is still prevalent in the residuals. However, the results do not differ from the first LIC model where the null hypothesis of cross-section independence in the residuals cannot be rejected. The CIPS tests of the residuals for LICs indicate no non-stationarity problems. The CD and CIPS tests of the residuals for MICs show that the models are devoid of any cross-section dependence and non-stationarity problems.

After the sample countries are split according to country income groups, financial openness remains significantly positively related to output volatility for MICs. For LICs, no significant relationship is found. At a more advanced stage of development, financial globalization could result in enhanced specialization making MICs more susceptible to industry-specific shocks and thereby increasing output volatility (Kose et al., 2009). Similar to the full country sample, after controlling for financial openness, no evidence is found regarding a link between FDI volatility and output volatility. The interaction term between financial openness and FDI volatility remains insignificant as well.

6.5 Conclusion

The chapter presented evidence regarding the link between financial openness and output volatility for sub-Saharan African countries from 1990-2011. This study specifically investigated how financial openness impacts on output volatility through the channel of volatile FDI flows: this has not been examined previously for the region. The study is further unique because of the use of a panel time-series estimator, the AMG estimator of Eberhardt and Teal (2010), which makes the findings robust to cross-section dependence.

The main findings of the study are as follows: (1) Financial openness increases output volatility; (2) No evidence is found that FDI volatility is related to output volatility; (3) The extent to which financial openness increases output volatility does not depend on the degree of

FDI volatility; (4) For MICs, financial openness increases output volatility, while for LICs increased trade openness and a higher level of economic development reduces output volatility.

The significant positive relationship between financial openness and output volatility highlights that financial openness remains a controversial issue. Although acknowledging that *de jure* financial openness indicators (as opposed to *de facto* financial openness indicators) are primarily concerned with the presence or not of legal restrictions on capital transactions, the results still pose questions relating to the IMF's recent altered position regarding the use of capital controls. After years of opposing the use of capital controls, the IMF adopted a more accommodating stance towards capital controls in that it may well broaden the policy space available to developing countries to manage and deal with external shocks (Essers, 2013; Sarno, Tsiakas, & Ulloa, 2016). This study's finding seems to support this view and further contributes towards this debate.

Financial liberalization remains an incomplete and ongoing process in sub-Saharan Africa (Misati & Nyamongo, 2012; Ahmed, 2013) and some countries may need to open up their capital markets using a more gradual approach. Pre-conditions to financial liberalization include a stable macroeconomic environment, well-developed local institutions and markets, and appropriate regulatory policies (Beck, Fuchs, & Uy, 2009). To liberalize capital flows, IMF (2012) advocates an "integrated approach" that is consistent with a country's institutional and financial development. This "integrated approach" proceeds through successive and often overlapping phases. FDI inflows should be liberalized first, followed by FDI outflows and long-term portfolio flows, and finally short-term portfolio flows. Each phase requires deeper and broader legal, accounting, financial, and corporate framework reforms (IMF, 2012). Regarding FDI inflows, this study's finding of no link between FDI inflow volatility and output volatility is in line with that approach.

Future research for sub-Saharan Africa should test the effect of capital flows composition on output volatility. Federico et al. (2013) stated that FDI volatility will reduce output volatility only if there is a positive correlation between FDI and other flows.

Appendix 6.A: Variables and data sources

Output volatility: HP filter to detrend annual country growth rates the benchmark value of $\lambda_{HP} = 100$ to adjust for the sensitivity of the trend portion. After applying the HP filter, an annual cycle term is obtained for each country. Following Jetter (2014), this study squares the cycle term to obtain a measurement for the annual volatility component of a country's growth rate. This value is subsequently divided by 100 to facilitate comparability. Country growth rates are obtained from World Bank WDI.

Financial openness: Lane and Milesi-Ferretti's (2007) "External Wealth of Nations Mark II" database (updated) was used to calculate the de facto financial openness indicator using the ratio of $\frac{(FA_{it}+FL_{it})}{GDP_{it}}$ with FA (FL) denoting the stock of external assets (liabilities).

FDI inflows: net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP. Series obtained from World Bank WDI.

Volatility of FDI inflows: Standard deviation of FDI inflows using three-year overlapping rolling windows with the method described in section 6.3.1.

CPI: Consumer price index (log) (2010=100) reflects changes in the cost to the average consumer of acquiring a basket of goods and services. The series is obtained from the World Bank WDI.

Government final consumption expenditure (% of GDP): General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). The series is obtained from the World Bank WDI.

Terms of trade volatility: Standard deviation of net barter terms of trade index (2000 = 100) using five-year overlapping rolling windows. The index is obtained from the World Bank WDI.

Trade openness: Sum of exports and imports of goods and services measured as a share of GDP with the series obtained from the World Bank WDI.

GDP per capita: GDP per capita (constant 2005 US\$) with the series obtained from the World Bank WDI.

Domestic credit: Private credit by deposit money banks and other financial institutions to GDP (%) with the series obtained from the World Bank Global Financial Development database.

Political rights: The Political Rights index from Freedom House is used as political stability indicator. The sub-categories of the index permit for the electoral process, political pluralism and participation, and functioning of government. The index ranges from 1 to 7 with 1 indicating the highest political rights.

Appendix 6.B: Sample countries

Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Ghana, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Republic of the Congo, Rwanda, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda.

Appendix 6.C: Financial openness and output volatility: The role of FDI volatility (MICs)

Table 6.3: Financial openness and output volatility: The role of FDI volatility (MICs). Augmented Mean Group (AMG) estimator

	Output volatility (1)	Output volatility (2)
Financial openness	0.0022**(0.0010)	0.0019*(0.0010)
FDI volatility	0.0019(0.0017)	n/a
Interaction term	n/a	0.0001(0.0001)
Log CPI	-0.2250(0.1650)	-0.1844(0.2061)
Government expenditure	-0.0050(0.0108)	-0.0036(0.1087)
TOT volatility	-0.0033(0.0026)	-0.0024(0.0029)
Trade openness	-0.0002(0.0002)	-0.0002(0.0002)
GDP per capita	-0.0002(0.0002)	-0.0002(0.0002)
Private credit	0.0171(0.0158)	0.0185(0.0168)
Political rights	0.0039(0.0392)	0.0020(0.0453)
RMSE	0.1712	0.1690
Observations	294	294
Countries	15	15
CD	0.449	0.328
CIPS	0.000	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p values.

In model 2, financial openness interacts with FDI volatility.

Appendix 6.D: Financial openness and output volatility: The role of FDI volatility (LICs)

Table 6.4: Financial openness and output volatility: The role of FDI volatility (LICs). Augmented Mean Group (AMG) estimator

	Output volatility (1)	Output volatility (2)
Financial openness	0.0018(0.0024)	0.0023(0.0030)
FDI volatility	-0.0020(0.0026)	n/a
Interaction term	n/a	-0.0001(0.0001)
Log CPI	-0.3682(0.6283)	-0.3022(0.6252)
Government expenditure	-0.0102(0.0157)	-0.0078(0.0160)
TOT volatility	-0.0007(0.0132)	0.0018(0.0104)
Trade openness	-0.0212*(0.0124)	-0.0215*(0.0121)
GDP per capita	-0.0040**(0.0016)	-0.0043**(0.0017)
Private credit	0.0215(0.0633)	0.0269(0.0670)
Political rights	0.0580(0.0736)	0.0416(0.0802)
RMSE	0.3173	0.3112
Observations	375	375
Countries	19	19
CD	0.112	0.095
CIPS	0.000	0.000

Note: ***, ** and * indicate the level of significance at 1%, 5% and 10% respectively with t-statistics in parentheses.

Root mean square error (RMSE) indicates the residual size of each model.

The figures reported for CD and CIPS tests are p values.

In model 2, financial openness interacts with FDI volatility.

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CHAPTER SEVEN

CONCLUSION AND POLICY RECOMMENDATIONS

7.1 Introduction

This research has examined issues raised in the literature regarding private capital flow volatility and financial openness in sub-Saharan Africa. Firstly, the research sought to investigate the determinants of private capital flow volatility. It further examined whether remittance volatility impacted on financial sector development. Next it examined the link between cross-border banking volatility and economic growth. To conclude, the thesis investigated whether financial openness contributed to output volatility in the region.

The first empirical chapter makes a unique contribution to the literature in a number of ways. Most empirical studies on capital flows focus on the determinants of capital flow levels, with few studies focusing on volatility determinants (Broto, Diaz-Cassou, & Erce, 2011). No study has focused exclusively on sub-Saharan Africa when investigating the determinants of private capital flow volatility. This study is further distinctive in that clearly-delineated cross-border bank lending data from the BIS Locational Banking Statistics were employed that has not been used by prior studies. The use of a panel time-series estimator, the AMG estimator of Eberhardt and Teal (2010), makes the findings robust to cross-section dependence and is another unique feature compared to the related literature.

Although the impact of remittances on financial sector development has been examined previously, this study is the first to investigate whether remittance volatility influenced financial sector development. Most studies within the remittances-financial development nexus focused on one characteristic of financial development (financial depth), while this study extends this to include financial sector efficiency. This study further contributes to the literature by not only focusing on the financial development of banks but also investigating the impact of remittances and remittance volatility on stock markets.

There are few empirical studies that have examined the link between cross-border banking volatility and economic growth. In addition, there is an absence of studies that have captured the influence of cross-border bank deposit flows on growth. This study makes a unique contribution to the literature by distinguishing separately between the effects of cross-border bank lending volatility and cross-border bank deposit volatility on economic growth.

No consensus exists in the theoretical and empirical literature on whether financial openness increases or reduces output volatility (Hwang, Park, & Shin, 2013; Meller, 2013). This study's unique contribution to the literature is the examination of how financial openness impacts on output volatility through the channel of volatile FDI flows. Output volatility could exhibit cross-section dependence through regional and macroeconomic linkages, and the use of the AMG estimator of Eberhardt and Teal (2010) to account for cross-section dependence is another unique feature of this study.

7.2 Summary of the findings

The main findings concerning the determinants of private capital flow volatility are as follows: (1) global liquidity lowers FDI volatility, while for MICs global liquidity and global risk are significant drivers of FDI volatility; (2) global risk increases portfolio equity volatility, with the quality of macroeconomic policies and financial openness found to be important pull factors in lowering portfolio equity volatility; (3) financial openness and depth lowers cross-border bank lending volatility. For LICs, global liquidity lowers cross-border bank lending volatility, while the quality of macroeconomic policies is an important pull factor in lowering volatility.

The empirical evidence from this thesis further reveals that remittance volatility is detrimental to both banking sector depth and efficiency. No evidence is found that remittance volatility is related to stock market development.

Regarding cross-border volatility and economic growth, this study provides evidence that cross-border bank deposit volatility is detrimental to economic growth when the sample includes only RRDCs. The results further indicate that cross-border bank deposit flows contribute to economic growth in sub-Saharan Africa, but no evidence is found that cross-border bank lending is related to economic growth.

Concerning financial openness and output volatility, the findings are as follows: (1) financial openness increases output volatility; (2) no evidence is found that FDI volatility is related to output volatility; (3) the extent to which financial openness increases output volatility does not depend on the degree of FDI volatility; (4) for MICs, financial openness increases output volatility, while for LICs increased trade openness and a higher level of economic development reduces output volatility.

7.3 Conclusion

The combined evidence reveals that sub-Saharan African countries should be concerned not only with private capital flow levels, but also the volatility of such flows. The significance of global push factors as determinants of private capital flow volatility is highlighted. While not disputing the relative stability of remittances relative to other private capital flow types, this study reveals that remittance volatility is not trivial and impacts on banking sector development. The results further indicate that cross-border bank loans and deposits require a differentiated analysis. Finally, this thesis indicates that financial openness remains a controversial policy option in sub-Saharan Africa and is a source of output volatility.

7.4 Recommendations

This thesis recommends some policy interventions necessary for sub-Saharan African countries to deal with volatile private capital flow occurrences and some of the consequences thereof.

Because global push factors are significant factors that shape volatility and are beyond the control of sub-Saharan African economies, it is difficult to draw blanket policy recommendations. Forbes and Warnock (2012) suggest that countries apprehensive about capital flow volatility effects should seek to strengthen their capacity to endure these volatile capital episodes rather than reduce the volatility. Most sub-Saharan African frontier economies can improve the quality of their data in order to monitor capital flows effectively (IMF, 2014). To use macro-prudential policies effectively, supervisory resources that include adequately trained and qualified staff, the availability of high-frequency data and the tools necessary to assess systemic risks must all be improved (IMF, 2014). Sub-Saharan African countries should claim greater representation in international financial institutions. Greater representation will enable broader international policy coordination and ensure that the global financial architecture is more inclusive as well as more responsive to developing countries.

Sub-Saharan African countries should have measures in place to monitor the predictability of remittances. A policy question regarding the cost of remittance transfer is necessary. Sub-Saharan Africa remains the most expensive region to send money to (World Bank, 2015) and lowering transaction costs should result in more remittances being channelled through formal channels, making flows more predictable and less volatile. More competition among money transfer operators could possibly reduce the cost of remittance transfer (Beck, Fuchs, & Uy, 2009). The formal financial sector should investigate which other financial demands remittance-recipients have beyond just offering savings accounts.

RRDCs should have measures in place to monitor the predictability of bank deposit flows. With the results further indicating that bank deposit flows are a driver of economic growth, policy makers should investigate ways to make banking less expensive for deposit customers. High minimum balance requirements and fees for cheque and savings account holders are prevalent in many African countries (Beck et al., 2009). The feasibility of investigating explicit deposit insurance within sub-Saharan Africa should be investigated, as only 24% of African countries have explicit deposit insurance (Demirgüç-Kunt, Lane, & Laeven, 2014).

The results in this thesis support the view that some countries may need to open up their capital markets using a more gradual approach. This is in line with the IMF's recently adopted view that "in certain circumstances, capital flow management measures can be useful" (IMF, 2012, p. 2). Fowowe (2013) argued that financial liberalization policies in sub-Saharan Africa did not achieve their objectives because of the absence of a stable macroeconomic environment in the 1980s and 1990s. In addition, financial liberalization policies were implemented and treated as mere attachments of structural adjustment programmes. To reap the benefits of financial liberalization requires sound macroeconomic policies, well-developed local financial institutions and markets, and adequate financial regulation and supervision (Beck et al., 2009; IMF, 2012). Capital flows need to be liberalized in a sequential order, starting with FDI inflows as FDI inflows are more closely correlated with growth than other flows (IMF, 2012). This is in line with the results from this thesis that found no relationship between FDI inflow volatility and output volatility.

Empirical analysis at a microeconomic level regarding the impact of remittances on recipient households' use of bank services is still limited to a relatively small number of countries (Brown, Carmignani, & Fayad, 2013) and could provide scope for future research. Using a differentiated approach to investigate the determinants of cross-border bank lending and deposits to sub-Saharan African countries is a further future research avenue. Investigating the determinants of cross-border bank deposit volatility is also advocated. The effect of capital flow composition on output volatility is further envisioned as a future research avenue.

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