# UNIVERSITY OF GHANA COLLEGE OF HUMANITIES UNIVERSITY OF GHANA BUSINESS SCHOOL

### STUDIES ON FINANCIAL SECTOR DEVELOPMENT AND INTERNATIONAL TRADE IN AFRICA

BY

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 $\mathbf{B}\mathbf{Y}$ 

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DEPARTMENT OF FINANCE

2019

### DECLARATION

I hereby declare that this thesis is my own work produced from research I carried out under supervision. This thesis has not been presented by anyone for any academic award in this or any other institution. All references made to work done by other people have been duly acknowledged. I am solely responsible for any shortcomings in this work.

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Date

### CERTIFICATION

"I hereby certify that this thesis was supervised in accordance with the procedures laid down by the University."

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Date

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# DEDICATION

To the loving memory of my father (Yakubu Gumabo Sare)

#### ABSTRACT

This thesis examines the relationship between financial sector development and international trade in Africa. Specifically, the study investigates (i) the direct and indirect effects of finance on trade via economic growth (ii) threshold effects of finance-trade nexus mediated by the levels of finance as well as (iii) sectoral effects and transmission channels of finance on international trade. It employs standard approaches namely the generalized method of moments (GMM), threshold and sample splitting; and a pooled mean group (PMG) to examine the linkages. The thesis documents the following three important findings: First, there are differential effects of finance on international trade. Specifically, improving the level of private (domestic) credit dampens (amplifies) exports and trade openness. However, there also exists a U-shaped relationship between private credit and trade measures at 5% level of significance suggesting that financial sector development may be detrimental (helpful) to trade for economies with low (high) level of private credit. Second, there is evidence of threshold effects suggesting that the precise impact of financial development on international trade is threshold-specific given the various indicators of finance. Thus, whether finance supports or limits international trade crucially depends on the attainment of a certain threshold which is both country and indicator-specific. Finally, a co-existence of a negative long run substitutability between finance and trade is found. However, higher sectoral value additions dampen the deleterious effect of finance on trade with huge impact emanating from the service sector.

This thesis makes important contributions to knowledge. Empirically, it provides evidence on how different measures of finance and sectoral value additions influence trade. It also presents new evidence on the threshold effects of finance on trade in Africa. Apart from establishing the unique optimal level of finance for each country, this thesis also brought to

bear how finance affects international trade in countries when their domestic level of financial sector development is below or above the threshold. To the best of the author's knowledge, this is a pioneering work on finance–trade nexus in Africa. Methodology-wise, this thesis models the thresholds of finance without assuming any *a prior* form in a way that does not only reveal the precise optimal value of finance but also how finance–trade plays out below and above the threshold.

Based on the findings of the study, this thesis makes key recommendations for policy. It is imperative for Central Banks in Africa to move their financial sectors towards an optimal level. In doing so, it is important for Central Banks to maintain a sound supervision of the financial markets with the aim of improving financial intermediation in supplying the right quality and quantity of finance that will enhance trading with the international markets. Lastly, to improved international trade in Africa, it is imperative for policy makers to tailor policies that aim to build complementarities that braces input–output and linkages among the industrial, agricultural, services and financial sectors.

## TABLE OF CONTENTS

| DECLARATIONii  |
|--|
| CERTIFICATION iii  |
| ACKNOWLEDGEMENTSiv   |
| DEDICATIONv  |
| ABSTRACTvi   |
| TABLE OF CONTENTS viii   |
| LIST OF FIGURESxii   |
| LIST OF TABLES xiii  |
| LIST OF ABBREVIATIONSxiv   |
| AUTHOR'S RESEARCH OUTPUTS FROM THE THESIS                                  |
| Peer review journal publicationxv  |
| Papers under reviewxv  |
| Working papersxv   |
| Conference papersxvi   |
| CHAPTER ONE1   |
| INTRODUCTION1  |
| 1.1 Background to the Study  |
| 1.2 Problem Statement  |
| 1.2.1 Effects of financial development on international trade              |
| 1.2.2 Threshold effects of financial development–international trade nexus |
| 1.2.3 Sectoral effects of finance on the level of international trade      |
| 1.3 Research Questions   |
| 1.4 Research Objectives  |
| 1.5 Scope of the Study   |
| 1.6 Justification and Significance of the Study                            |
| 1.7 Structure of the Thesis  |
| CHAPTER TWO  |
| STYLIZED FACTS   |
| 2.1 Introduction   |
| 2.2 Stylized Facts on Finance–Trade Nexuses in Africa                      |

| 2.3 | Inter         | rnational Trade and Sectoral Value Additions in Africa                  | .16 |
|-----|---------------|---|-----|
| 2.4 | Conc          | clusion   | .18 |
| CHA | APTER         | R THREE   | .19 |
| LIT | ERAT          | URE REVIEW  | .19 |
| 3.1 | Intro         | duction   | .19 |
| 3.2 | Theo          | pretical Literature   | .19 |
| 3.3 | Emp           | irical Literature   | .21 |
| 3.  | 3.1           | Financial development-international trade nexus                         | .21 |
| 3.  | 3.2           | Threshold effects of financial development and international trade      | .26 |
| 3.  | 3.3           | Financial development, sectoral value additions and international trade | .32 |
| 3.4 | Conc          | clusion   | .38 |
| CHA | <b>APTE</b> F | R FOUR  | .40 |
| ME  | ГНОD          | OLOGY   | .40 |
| 4.1 | Intro         | duction   | .40 |
| 4.2 | Data          | Sources and Scope   | .40 |
| 4.3 | Data          | Description   | .41 |
| 4.  | 3.1           | Financial development   | .41 |
| 4.  | 3.2           | International trade   | .42 |
| 4.  | 3.3           | Sectoral value additions  | .42 |
| 4.  | 3.4           | Control variables   | .43 |
| 4.4 | Mod           | el Specifications   | .43 |
| 4.  | 4.1           | Objective one   | .44 |
| 4.  | 4.2           | Objective two   | .49 |
| 4.  | 4.2           | Objective three   | .52 |
| 4.5 | Conc          | clusion   | .57 |
| CHA | APTEF         | R FIVE  | .58 |
| EMI | PIRIC         | AL RESULTS: FINANCIAL DEVELOPMENT AND INTERNATION                       | AL  |
| TRA | DE N          | EXUS: DOES MEASURE OF FINANCIAL DEVELOPMENT MATTER?                     | .58 |
| 5.1 | Intro         | duction   | .58 |
| 5.2 | Desc          | riptive Statistics  | .58 |
| 5.3 | Emp           | irical Results  | .62 |

| 5.3.1 Robustness analysis   | 75         |  |  |  |  |  |
|---|------------|--|--|--|--|--|
| 5.4 Policy Implications and Recommendations                                 |            |  |  |  |  |  |
| 5.5 Conclusion  |            |  |  |  |  |  |
| CHAPTER SIX   | 87         |  |  |  |  |  |
| EMPIRICAL RESULTS: THRESHOLD EFFECTS OF FINANCIA                            | L SECTOR   |  |  |  |  |  |
| DEVELOPMENT ON INTERNATIONAL TRADE  |            |  |  |  |  |  |
| 6.1 Introduction  |            |  |  |  |  |  |
| 6.2 Findings and Discussions  |            |  |  |  |  |  |
| 6.3 Conclusion and Policy Implications                                      |            |  |  |  |  |  |
| CHAPTER SEVEN   |            |  |  |  |  |  |
| EMPIRICAL RESULTS: FINANCIAL DEVELOPMENT, SECTORAL EF                       | FECTS AND  |  |  |  |  |  |
| INTERNATIONAL TRADE   |            |  |  |  |  |  |
| 7.1 Introduction  |            |  |  |  |  |  |
| 7.2 Empirical Results   |            |  |  |  |  |  |
| 7.2.1 Descriptive statistics  |            |  |  |  |  |  |
| 7.2.2 Estimations of short and long run relationships among finance, sector | oral value |  |  |  |  |  |
| additions and international trade   | 137        |  |  |  |  |  |
| 7.2.3 Finance, sectoral value additions, transmission channels and trade    | 140        |  |  |  |  |  |
| 7.3 Policy Implications and Recommendations                                 | 146        |  |  |  |  |  |
| 7.4 Conclusion  | 150        |  |  |  |  |  |
| CHAPTER EIGHT   | 152        |  |  |  |  |  |
| SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS                             | 152        |  |  |  |  |  |
| 8.1 Introduction  | 152        |  |  |  |  |  |
| 8.2 Summary of Findings and Conclusion                                      | 152        |  |  |  |  |  |
| 8.2.1 Financial development and economic growth effect on international     | l trade153 |  |  |  |  |  |
| 8.2.2 Threshold effects of finance–trade nexus                              | 153        |  |  |  |  |  |
| 8.2.3 Sectoral effects of finance in the level of international trade       | 154        |  |  |  |  |  |
| 8.3 Contributions to Knowledge  | 155        |  |  |  |  |  |
| 8.3.1 Contribution to empirics  | 155        |  |  |  |  |  |
| 8.3.2 Contribution to methodology   | 155        |  |  |  |  |  |
| 8.3.3 Contribution to theory  | 156        |  |  |  |  |  |

| 8.3.4 Co    | ontribution to practice (policy recommendations)15                           | 56 |
|-------------|--|----|
| 8.3.4.1     | Financial sector development and its relationship with international trade15 | 56 |
| 8.3.4.2     | Threshold effects of finance and its mediation role in finance-trade nexus15 | 57 |
| 8.3.4.3     | Financial development, sectoral value additions and international trade15    | 57 |
| 8.4 Areas N | ecessitating Further Research Efforts15                                      | 58 |
| REFERENCE   | S  | 59 |
| APPENDICE   | S17  | 12 |
| Appendix 1: | Panel Unit Root Tests17  | 2  |
| Appendix 2: | Panel Cointegration Tests17  | 2  |
| Appendix 3: | Descriptive Statistics   | 13 |
| Appendix 4: | Tests for Existence of Thresholds17  | 19 |
| Appendix 5: | Confidence Intervals for Threshold Effects                                   | 90 |
|             |  |    |

### LIST OF FIGURES

| Figure 2.1: Trends of sectoral value additions                                    | 17  |
|---|-----|
| Figure 5.1: Private credit and international trade                                | 60  |
| Figure 5.2: Domestic credit and international trade                               | 61  |
| Figure 6.1: Average values of finance against threshold in finance–exports        | 128 |
| Figure 6.2: Average values of finance against threshold in finance-trade openness | 129 |
| Figure 6.3: Financial development threshold and export effects                    | 130 |
| Figure 6.4: Financial development threshold and trade openness                    | 131 |

# LIST OF TABLES

| Table 2.1: 5-year averages of GDP growth, financial development, inflation and      |
|---|
| international trade indicators in Africa13  |
| Table 2.2: Sectoral value additions and international trade in Africa    17         |
| Table 5.1: Descriptive statistics and correlation coefficients 59                   |
| Table 5.2: Financial development and exports nexus                                  |
| Table 5.3: Financial development-trade openness nexus                               |
| Table 5.4: Financial development, exports and trade openness nexuses                |
| Table 6.1: Testing for existence of threshold                                       |
| Table 6.2: Threshold estimation effects in Algeria and Benin    96                  |
| Table 6.3: Threshold estimation effects in Burkina Faso and Burundi    101          |
| Table 6.4: Threshold estimation effects in Cameroon and Central African Republic104 |
| Table 6.5: Threshold estimation effects in Chad and Congo Republic                  |
| Table 6.6: Threshold estimation effects in Cote D'Ivoire and Egypt Arab Republic    |
| Table 6.7: Threshold estimation effects in Gabon and Kenya                          |
| Table 6.8: Threshold estimation effects in Malawi and Mali    Malawi                |
| Table 6.9: Threshold estimation effects in Morocco and Rwanda    119                |
| Table 6.10:Threshold estimation effects in Senegal and Sudan    122                 |
| Table 6.11:Threshold estimation effects in Togo and Tunisia    125                  |
| Table 7.1: Descriptive statistics 135   |
| Table 7.2: Correlation coefficient matrix   |
| Table 7.3: Finance, sectoral value additions and international trade                |
| Table 7.4: Finance, sectoral value additions, transmission channels and trade       |

## LIST OF ABBREVIATIONS

| ADF    | Augmented Dicky–Fuller                                 |
|--------|--|
| ARDL   | Autoregressive Distributed Lag                         |
| BIC    | Bayesian Information Criterion                         |
| FDI    | Foreign Direct Investment                              |
| GDP    | Gross Domestic Product                                 |
| GMM    | Generalized Method of Moments                          |
| LM     | Lagrange Multiplier                                    |
| LR     | Likelihood Ratio                                       |
| MG     | Mean Group   |
| OECD   | Organization for Economic Co-operation and Development |
| OLS    | Ordinary Least Squares                                 |
| PMG    | Pooled Mean Group                                      |
| SSA    | Sub–Saharan Africa                                     |
| SSE    | Sum of Squared Errors                                  |
| UNCTAD | United Nations Conference on Trade and Development     |
| UNECA  | United Nations Economic Commission for Africa          |
| WDI    | World Development Indicators                           |

#### **AUTHOR'S RESEARCH OUTPUTS FROM THE THESIS**

Prior to submission, a portion of the thesis was published in a peer reviewed journal while others are presently under review. Some chapters were also accepted for conference presentations.

#### Peer review journal publications

- Sare, Y. A., Aboagye, A. Q. Q. & Mensah, L. (2019). Financial development, sectoral effects and international trade in Africa: An application of Pooled Mean Group (PMG) estimation approach, *International Journal of Finance and Economics*, 24, 328–347.
- Sare, Y. A., Aboagye, A. Q. Q., Mensah, L. & Bokpin, G. A. (2018). Effect of financial development on international trade in Africa: Does measure of finance matter? *The Journal of International Trade and Economic Development*, 27(8), 917– 936.

#### Paper under review

 Sare, Y. A., Aboagye, A. Q. Q. & Bokpin, G. A. Threshold effects of financial sector development on international trade in Africa. *International Journal of Finance and Economics [Revised and resubmitted]*

### Working papers

- Sare, Y. A. Aboagye, A. Q. Q. Mensah, L. & Bokpin, G. A. Effect of financial development on international trade in Africa: Does measure of finance matter? *Economic Research Southern Africa, [Under review].*
- 2. Sare, Y. S. Aboagye, A. Q. Q., Mensah, L. & Bokpin, G. A. Financial development, sectoral effects and international trade in Africa: An application of Pooled Mean

Group (PMG) estimation approach, *Economic Research Southern Africa*, [under review].

### Conference papers

- Sare, Y. A., Aboagye, A. Q. Q., Mensah, L. & Bokpin, G. A. (2018). Threshold effects of financial sector development on international trade in Africa, 8th International Conference on Restructuring of the Global Economy (ROGE), University of Oxford, UK, 9th–10th July 2018.
- Sare, Y. A., Aboagye, A. Q. Q., Mensah, L. & Bokpin, G. A. (2018). Financial Development, Sectoral Effects and International Trade in Africa: An Application of Pooled Mean Group (PMG) Estimation Approach, *the 4th Annual Conference of Islamic Economics and Islamic Finance* in Chestnut Conference Centre, Toronto University, Toronto, Canada on 1<sup>st</sup> November, 2018.

### **CHAPTER ONE**

#### **INTRODUCTION**

#### **1.1 Background to the Study**

International trade is an important factor for every country's development process. Following this, extant studies have aimed at identifying critical factors influencing economic growth and financial development. According to UNCTAD (2014), international trade ensures the movement of goods and services and factors of production across borders. On the back of that, international trade is predicted to enhance economic growth and financial development via technology spill-overs, knowledge transfers and heightening competition, among others (see Ben-David & Loewy, 1998, 2000, 2003; Grossman & Helpman, 1991). Given this, many countries including those in Africa have instituted policies to foster cross-border trade between and among nations.

Indeed, international trade costs are substantially large for developing countries such as those in Africa. While the literature has suggested that reducing these costs may be associated with higher trade flows, ascertaining precise programmes and policies that permit these developing economies to lower these costs are still unclear and remains a hurdle. However, recent evidence shows that the development of domestic financial sectors may be a critical conduit to reducing trade costs and as well turn countries towards products in which they have comparative and competitive advantages (Porter, 1990). Despite the theoretical evidence on finance–trade link, empirical literature on the exact impact of financial development on international trade is controversial. For instance, evidence exists to show that well–developed financial sectors allow industries to substantially depend on external finance to export more (Svaleryd & Vlachos, 2002; Beck, 2002; Manova, 2013). Moreover, recent studies (Kohn,

Leibovici & Szkup, 2016; Gross & Verani, 2013) find that financial friction is a consequence of financial sector under-development which influences the dynamics of countries' export orientation. Thus, lower financial sector is an impediment to international trade. Indeed, several structures of international trade relates with domestic level of financial development. For instance, cross-border trading in foreign economies involves significant multiplicity of upfront investments notably market research, product differentiation and distribution channels (Baldwin & Krugman, 1989). More so, entering into foreign markets involve efficient financial intermediation in such a way that resources are fully utilized to support the cross-border trade. However, limited access to external finance can limit domestic firms with low financial resources from undertaking such investments aimed at spurring international trade. Moreover, international trade transactions can potentially be conditioned on higher variable costs involving shipping, tariffs, insurance, among others. In these circumstances, under-developed financial sector exacerbates financial constraints of firms who are unable to meet the initial investments that come along with international trade. Abor, Agbloyor and Kuipo (2014) argue that firms' access to finance improves their likelihood to trade internationally. According to the authors, such financial access allows firms to pay for the high fixed costs of exporting, international marketing and branding, and as well meet higher quality standards required for foreign markets.

While the work of Baltagi, Demetriades and Law (2009) and Kim, Lin and Suen (2010a) suggest a trade–enhancing effect of finance, this study argues that the impact of financial development on trade varies depending on whether the domestic financial sector drives country's resources towards activities that generate their comparative advantage or divert them away from such activities. In addition, due to financial constraints, under–developed financial sectors may not have a sufficiently high level of capacity to support firms engaging

in international trade to meet those high investment costs. Then, the trade effects from finance may differ according to the level of domestic financial development.

#### **1.2 Problem Statement**

The problem statement presented in this section of the thesis is carved out of three thematic areas in finance–trade nexus in accordance with identified gaps in the literature. To surmise, existing studies have failed to (i) re–examine effects of finance on international trade in developing countries perspective and in this case Africa (ii) examine threshold effects of financial development on international trade nexus at which financial development is used as a threshold variable as well as (iii) examine sectoral effects of finance on international trade. These problems are now individually discussed in detail below.

#### 1.2.1 Effects of financial development on international trade

Theoretical literature on the relationship between trade and financial development are unclear. For instance, more trade increases international competition which propels productivity and growth as competition encourages efficiency. On the other hand, higher trade openness may inhibit economic growth of local infant firms who are unsound for competition and may need state protection.

Indeed, existing empirical literature has largely studied the impact of trade on economic growth (see for instance Shaheen, Awan, Wagas & Aslam, 2011; Asfaw, 2014; Adeleye, Adeteye & Adewuyi, 2015; Rahman, Shahbaz & Farooq, 2015). However, beyond the impact of trade on economic growth, theoretical literature, on the other hand, also suggests that development of the domestic financial sector spurs economic growth (see for instance Schumpeter, 1911; Patrick, 1966). However, empirical literature on finance–growth nexus is

largely on direction of effect (De Gregorio & Guidotti, 1995; Levine, Loayza & Beck, 2000; Masten, Coricelli & Masten 2008; Khan, 2008; Mishra & Narayan, 2015). It is imperative to note that, most of the panel and cross–section studies (King and Levine, 1993; Levine et al., 2000; Khan & Senhadji, 2000; Khan, 2008) find support for the positive relationship between financial development and economic growth.

Apart from the relationship between (i) trade and economic growth and (ii) financial sector development and economic growth, very few studies have attempted to examine how financial development-international trade nexus plays out. Literature on finance-trade nexus is still emerging but less attention is paid to specific countries and regions characteristics (see Baltagi et al., 2009 & Kim et al., 2010a, b). Rajan and Zingales (2003) argues that when a country de-restricts its borders by way of opening up to international trade and capital flows, such country is more probable to benefit from trade openness as it potentially triggers competition and threatens the vested interest of the incumbents. Similar findings were also reached by Law and Demetriades (2006).

Beck (2002) examines the link between financial development and international trade where evidence shows a statistically significant and economically large impact of finance measured by private credit on manufactured exports as share of GDP and as share of total merchandise exports. The author concludes that countries with a well–developed financial system have a higher export share and trade balance in manufactured goods.

From the foregoing, empirical studies on the relationship between financial development and international trade and in SSA are very limited and those pertaining to Africa in general are almost nonexistent. Apart from this, the few existing studies are silent on how the impact of finance on trade plays out.

#### 1.2.2 Threshold effects of financial development–international trade nexus

Empirical studies that have looked at finance–economic growth such as Rousseau and Wachtel (2011) observe that, the link between financial development and economic growth might be too complex than what these simple relationships show and the same also play out in finance–trade nexus. Extant studies therefore highlighted that, whether financial development supports or lowers economic growth and by extension international trade depends on a certain threshold of finance (see for instance Arcand et al., 2012; Ibrahim & Alagidede, 2016).

Some studies (Cecchetti & Kharroubi, 2012; Arcand et al., 2012; Samargandi et al., 2015; Ibrahim and Alagidede, 2016) have found that, finance–economic growth nexus is intrinsically inverted U–shaped where finance increases growth up to a certain point above which growth decreases with increasing finance.

Svaleryd and Vlachos (2002) examine the relationship between financial development and international trade. Their results from the cross-sectional and panel estimations reveal an economically significant nexus between trade and financial markets with causality flowing in both directions.

Beyond the linear relationship, using cross-country data and initial real income per capita as the threshold variable, Kim and Lin (2009) show that, significant threshold effects exist in the relationship between trade and economic growth where greater openness to international trade promotes economic growth for only high income economies. Their evidence suggests that, the relationship between trade and growth is nonlinear. Specifically, Zahonogo (2016) finds an inverted U–shaped nexus which is robust to indicators of trade and model specification. This finding may appear to resolve the seemingly conflicting results in the

empirical literature on the threshold effects. However, what is missing in the literature is the mediation role of key variables influencing the relationship between finance and trade. Kim (2011) observes that the real effect of trade is contingent on the level of financial development and inflation. Specifically, openness to trade has insignificant impact in countries with well–developed financial sector but benefit countries with under-developed financial system.

Interestingly, literature is silent on the role of mediating variables in refereeing the impact of finance on trade in Africa. Indeed, discontinuities in this relationship may potentially be the outcome of countries' domestic financial under-development. However, despite the promising evidence projecting the critical role of domestic financial development, empirical efforts have not been thorough in investigating these effects. Even those studies that attempt to examine these threshold effects suffer from two important weaknesses. First, the existing empirical studies on the threshold effects have extensively relied on basic threshold estimation techniques in determining the existence of nonlinearity in finance–growth and/or finance–trade nexuses by imposing exogenous thresholds by including quadratic square terms in the finance–trade equation. This approach does not show the confidence intervals within which the threshold estimates are lie. Second, the majority of these earlier studies are unable to rigorously and empirically examine whether these nonlinearities in finance–trade relationship are arbitrated by the level of finance.

#### 1.2.3 Sectoral effects of finance on the level of international trade

Theoretically, Kletzer and Bardhan (1987) submit that countries with a relatively higher level of financial sector development have a comparative advantage in industries and sectors that largely depend on external finance. Beck's (2002) theoretical model argues that financial

sector helps countries to specialize and exploit economies of scale such that economies with a well-developed financial system and a higher level of external finance have a comparative advantage in sectors that show high scale economies. Beck (2002) further contends that, such link might also be demand-driven so that countries with larger export shares in sectors with scale economies have better developed financial systems. Empirical findings of Beck (2002) reveal that financial development positively impacts on manufactured exports as share of GDP.

Hur and Ryanto (2006) investigate how the interplay between a country's level of financial sector development and its firms' asset structure influence the trade flow of different industries. The authors hypothesize that countries with higher (lower) financial development will have higher exports share and trade balance in industries with less (more) tangible assets.

Literature examining the impact of finance on trade through its effect on the various sectors of the economy is very limited. More recently, Ibrahim and Alagidede (2016) find that while both trade and financial development positively and robustly affects economic growth in Sub–Saharan Africa (SSA), the extent to which finance enhances growth depends on the relative speed of growth in finance and real sector. Notwithstanding these studies, what the researcher does not know is, how financial sector development impacts on trade through the various sectors of the economy namely agriculture, industrial and service sectors. Beck (2002), Hur et al. (2006) and Ibrahim and Alagidede (2016) also study the sectoral value additions and how they affect economic growth but these studies failed to empirically examine whether domestic financial sector interacted with sectoral value additions significantly promotes or inhibits economic growth and trade in Africa.

#### **1.3** Research Questions

The above discussions unearth the following important research questions:

- 1. How does financial sector development affect international trade in Africa?
- 2. To what extent is the overall impact of financial development on international trade threshold–specific?
- 3. What is the nature and sectoral channels through which financial development impacts on international trade?

#### **1.4 Research Objectives**

The main objective of the thesis is to examine the interrelationships in financial development–sectoral value additions and international trade–nexuses in Africa. In particular, the study explores the dynamic relationship between finance and international trade in Africa; threshold effects of finance–trade relationship as well as pass–through effects of finance–trade link. The specific objectives of the study are as follows:

- 1. To investigate the overall effect of financial development on international trade in Africa;
- 2. To establish the precise threshold effects in finance-trade nexus using financial development as a threshold variable; and
- 3. To examine financial development, sectoral value additions as transmission channels through which finance shapes international trade in Africa.

### **1.5** Scope of the Study

This study relies on annual data from 46 countries in Africa. Only countries in this continent are included because, coupled with the relatively less developed financial sectors, Africa's

international trade contribution to global trade in the past decades has not been impressive despite efforts to spur trade (UNCTAD, 2014). The data which is gathered from the World Development Indicators (WDI) of the World Bank falls within the period 1980–2016. While the study would have covered the entire countries in Africa, the choice of the countries selected is exclusively based on data availability for a relatively longer time period.

### 1.6 Justification and Significance of the Study

Indeed, given the dearth of literature in the three critical thematic areas namely financetrade- nexus, thresholds of finance-trade and finance-sectoral-trade effect, this study makes contributions to the literature in different respects. First, theoretically, examining the relationship between the level of financial development and international trade has important implications for trade theories. While the Ricardian model underscores variations in countries' technology as a crucial factor explaining differences in trade flows, the Heckscher–Ohlin model show differences in international trade based on the level of the countries' factor endowments namely labour, land and physical capital. Beyond this, the study models whether cross–country differences in finance explain trade flows in Africa where financial sector development is taken as either a conduit in accumulation of physical capital or part of the economy–wide production technology.

Second, while the extant literature has investigated the finance-trade nexus in exploring the direct effects of finance, to the best of the researcher's knowledge, the optimal level of finance consistent with international trade has not been studied especially in Africa. This study thus explores the dearth of empirical studies and introduces a previously missing but critical link in the finance-trade literature. Specifically, this study provides empirical evidence from the perspective of developing countries as it highlights the precise impact of

finance on trade flows. The study therefore presents important policy implications for conducting effective monetary policy aimed at spurring international trade on the continent.

Third, the thesis empirically determines the nonlinearities in finance–trade relationship which hitherto have not witnessed much attention in the literature. This study empirically reveals the exact trade effect of finance under the different threshold values. Specifically, the thesis contributes to existing literature by unearthing the precise thresholds above or below which finance spurs or limits international trade in Africa. While discussions on trade have received much attention, sectoral contributions to trade flows have been under studied. Beyond empirically revealing the relative short and long run sectoral contributions, this study examines whether finance magnifies or dampens the effects of sectoral value additions on trade flows. By explicitly distinguishing between the long and short run, we also attempt to show which sector significantly contributes to trade given the level of domestic financial development.

The last contribution of the study lies on its use of different econometric approaches which have not seen much application in recent literature. For instance, in establishing the nonlinearities, Hansen's (2000) sample splitting threshold estimation approach was employed which to the best of the researcher's knowledge, has not been used in examining finance-trade nexus in Africa.

Overall, the thesis provides key policy implications and recommendations for conducting effective macroeconomic policies aimed at improving the continent's trade with the rest of the world.

#### **1.7** Structure of the Thesis

The thesis is organized as follows. Chapter one introduces the entire study and presents the background to the study, problem statement, research questions, research objectives, scope of the work, significance of the study and arrangement of entire thesis. Chapter two extensively explores the stylized facts on the background statistics. Chapter three presents the relevant literature for all the three thematic areas of this study. This chapter extends the existing studies by introducing a previously missing link in the finance–trade literature and critically examines how the impact of finance on trade is conditioned on countries' level of financial development.

Chapter four spells out the methodology employed for the study. This chapter details the data description and sources which the study relied on for the estimations and analyses. The chapter also specified the empirical strategy and model specifications. Chapter five presents the results on the first objective which is to investigate the overall effect of financial development on international trade in Africa. Chapter six also presents results on the second objective which is aimed at examining potential threshold effects in financial development—international trade nexus using financial development as a threshold variable. Chapter seven, however, presents result on the third objective which is to examine the linkages among financial development, sectoral value additions and international trade in Africa.

Chapter eight concludes the study by summarizing the salient research findings, drawing key conclusions providing recommendations for policy. It also offers areas for future research.

### **CHAPTER TWO**

#### STYLIZED FACTS

#### 2.1 Introduction

In this chapter, we provide some stylized facts on domestic financial sector development, international trade, sectoral value additions and other key variables in Africa. This is aimed at providing brief background statistics on the trajectory of finance and trade indicators. In this regard, it begins by presenting a discussion on domestic financial development and international trade trends before highlighting on sectoral value additions and trade in Africa.

#### 2.2 Stylized Facts on Finance–Trade Nexuses in Africa

According to UNCTAD (2014), international trade guarantees the movement of goods and services and factors of production across national borders. Through this, trade is an important conduit to financial development and economic growth and contributions of trade to economic growth are large albeit differently. Given this, many countries including those in Africa have instituted policies to foster cross–border trade between and among nations. In the case of Africa, from Table 2.1 as we examine the relationship between financial development and international trade including other variables in the trade literature, it is evident that there is a trend between financial development, inflation, economic growth and international trade at least over the sample period 1981 to 2015. For instance, trade openness as a percentage of GDP consistently increased from 50.51% in 1981–1985 to 67.77% in 2006–2010 before decreasing to 61.37% in 2011–2015. Around the same time, GDP growth rate also increased, albeit not monotonically, from 0.60% to 5.57% before also reducing to 4.12% from its initial rate in 2006–2010. Exports and imports of goods and services as a proportion of GDP also followed similar pattern. Specifically, both exports and imports increased and decreased

around the same period. Exports and imports individually averaged almost 30% of GDP suggesting a near balanced trade over the period 1981–2015.

|             | GDP     | Domestic | Private | Trade     |          | Exports | Imports |  |  |
|-------------|---------|----------|---------|-----------|----------|---------|---------|--|--|
| Voor        | growth  | credit   | credit  | Inflation | openness | (% of   | (% of   |  |  |
| 1 Cai       | (annual | (% of    | (% of   | (%)       | (% of    |         |         |  |  |
|             | %)      | GDP)     | GDP)    | GDP)      |          | GDP)    | GDP)    |  |  |
| 1981 - 1985 | 0.60    | 52.53    | 34.48   | 11.72     | 50.51    | 24.03   | 26.48   |  |  |
| 1986 - 1990 | 0.54    | 54.20    | 35.68   | 10.64     | 48.92    | 24.11   | 24.81   |  |  |
| 1991 - 1995 | 0.51    | 55.54    | 37.29   | 9.94      | 49.32    | 25.17   | 24.15   |  |  |
| 1996 - 2000 | 1.69    | 55.87    | 38.19   | 9.45      | 50.65    | 26.12   | 24.53   |  |  |
| 2001 - 2005 | 1.91    | 56.00    | 39.23   | 9.23      | 52.20    | 27.42   | 24.78   |  |  |
| 2006 - 2010 | 5.57    | 69.95    | 59.15   | 7.13      | 67.77    | 34.50   | 33.28   |  |  |
| 2011 - 2015 | 4.12    | 59.86    | 47.52   | 5.04      | 61.37    | 29.70   | 31.67   |  |  |
| 1981 - 2015 | 3.18    | 64.76    | 50.16   | 8.44      | 59.97    | 29.99   | 29.98   |  |  |

Table 2.15-year averages of GDP growth, financial development, inflation andinternational trade indicators in Africa

Source: Author's computation using World Development Indicators (WDI).

With regard to the continent's integration with the international markets, trade openness as a percentage of GDP decreased from 50.51% in 1981–1985 to 49.32% in 1991–1995 before increasing to 52.20% in 2001–2005 and 67.77% in 2006–2010 (see Table 2.1). Meanwhile, exports increased from 24.03% in 1981–1985 to 25.17% in 1991–1995 and further increased to 27.42% to 34.50% in 2006–2010. However, while trade openness averaged 59.97%, exports over the period 1981–2015 measures at 29.99%. Despite efforts to improve economic performance in the past few decades by policy makers in Africa, the continent's trade performance has not been impressive. According to Gupta and Yang (2006), while trade has increased at about three-fourths of the world rate, Africa's performance lags behind compared to other developing countries with primary commodities and fuels accounting for the largest share of exports. Sakyi and Egyir (2017) argue that the extent to which a country

gains or loses from trade largely depends on several country–specific factors. Key among these factors are poor design and implementation of national trade policies (UNECA, 2004); weak institutions (Dollar & Kraay, 2003; Matthew & Adegboye, 2014) and trade structure resulting from poor diversification of production and exports (UNCTAD, 2008). Furthermore, UNCTAD (2005) opines that the low level of international trade in developing countries can be attributed to the lack of focus by policymakers on what exactly drives trade.

Iwanow and Kirkpatrick (2009) show that the percentage share of manufacturing exports in total exports in Africa is less than half of the world average and revolves around 30% over the past decades with improved share of 35.4% in 2002. Indeed, the pattern of African exports is strongly influenced by the continent's historical links with the outside world (Geda, 2002). Exports statistics from World Trade Organization show that, more than 80% of exports from Africa are destined to the United States of America and the European Union accounting for only a small proportion of the total exports. However, Geda (2013) documents that the last few decades have seen a considerable shift from these traditional trading partners to the emerging economies of China, Brazil and India.

Notice that, after financial coverage, measured by domestic credit provided by the financial sector, increased from 52.53% in 1981–1985 to 54.20% in 1986–1990, thereafter it consistently increased to 59.86% in 2011–2015. Private credit monotonically increased over the entire period although it decreased from 59.15% to 47.52% between 2006–2010 to 2011–2015 giving their respective averages of 64.76% and 50.16% to GDP. Inflation is computed on the basis of annual consumer price index which stood at 11.72% in 1981–1985 consistently declined over the entire period. Indeed, recent growth rates experienced in the continent can partly be attributed to the development of the financial sector (Ibrahim & Alagidede, 2017). While the financial sectors in SSA are largely underdeveloped, it is also

noticed that the financial sector development is heavily bank-based largely dominated by foreign banks (Andrianaivo & Yartey, 2009).

Senbet and Otchere (2006) surveyed some financial sector reforms in Africa in the 1980s and 1990s and argue that the desire to improve the financial sector in Africa led to the institutionalization of key reforms. Key among these reforms include the liberalization of interest rates, restructuring and privatization of state-owned banks, abolishing of credit ceilings, introduction of a variety of measures to promote development of financial markets, including money and stock markets. The rest are private banking systems, along with bank supervisory and regulatory schemes. Through these reforms, the banking sectors were able to strengthen their capital bases and improve risk management as further espoused by Mlambo, Kesekende and Murinde (2012).

Since the mid–1980s and early 1990s, many countries in Africa implemented several financial sector reforms aimed at streamlining and privatizing the largely state controlled banks as part of the IMF and World Bank Structural Adjustment Policies (SAP). Indeed, the SAP also saw an overhaul of supervisory and regulatory frameworks in the financial sector tailored at deepening the financial sector. Domestic credit to the private sector as a percentage of GDP is a common measure of financial deepening. The indicator comprises claims on the private sector by deposit taking financial institutions thus reflecting the role of financial intermediaries in efficient resource allocation such as channeling savings to private sector investors.

Indeed, the higher domestic credit to the private sector provides evidence to the improved productivity in the financial services. However, despite the improvement, there is evidence that relative to other developing economies, financial sector development in Africa have been slow in terms of efficiency and size (Honohan & Beck, 2007; Allen et al., 2012). After recent

15

policy changes including financial liberalization and development, further attempts at integrating with the world market did not yield the expected outcome. Many African countries are still showing limited economic progress even though the continent's financial systems have progressed marginally over the past 20 years. However, the promise of efforts in liberalization, privatization and stabilization in the 1980s has only been partly fulfilled, while the benefits of deeper, broader, and cheaper finance have not yet been realized (Beck et al., 2011). While the financial sectors in Africa are largely underdeveloped, it is also noticed that the financial sector development is heavily bank-based (Andrianaivo & Yartey, 2009). There is evidence that the relative underdevelopment of the Africa's domestic financial development is as result of weak governance, heavy informality, economic and political instability (Beck & Honohan, 2007), weak institutions (Singh et al., 2009) and sparse population (Allen et al., 2012). However, Ibrahim and Alagidede (2017) suggest that legal origin largely explains the cross-country differences in the level of domestic financial development in SSA.

#### 2.3 International Trade and Sectoral Value Additions in Africa

Beyond the financial sector, value additions of the real sector are also paramount and worth noting. Between 1980 to 2015, manufacturing sector's value additions is the lowest, averaging 15.80% followed by agricultural value additions which measure at 15.87% of GDP (see Table 2.2). Value additions in the service sector are the highest averaging 49.99%. Interestingly, evidence from Table 2.2 suggests that the manufacturing and agricultural sectors recorded their best performances in 1988–1995. However, apart from 2012–2015, the period 1996–2003 saw the service sector registering its highest value addition of 50.83%. It is argued that, the service sector plays a critical role in Africa's development strategy, whether it leverages the natural resource base (African Development Bank, 2013) or the promising industry and manufacturing sectors (Harrison et al., 2014; Lin & Rosenblatt, 2012). Indeed,

according to UNCTAD (2015), the service sector is the dominant sector in most African countries on the back of declining agricultural sector as more exploratory mineral resources are discovered on the continent over time.

| Year        | Agriculture,<br>value added<br>(% of GDP) | Services,<br>etc.<br>value<br>added<br>(% of<br>GDP) | Industry,<br>value<br>added<br>(% of<br>GDP) | Manufacturing,<br>value added<br>(% of GDP) | Domestic<br>credit to<br>private<br>sector (%<br>of GDP) | Exports<br>of<br>goods<br>and<br>services<br>(% of<br>GDP) | Trade<br>(% of<br>GDP) | GDP per<br>capita, PPP<br>(constant<br>2005<br>international<br>\$) |
|-------------|---|--|--|---|--|--|------------------------|---|
| 1980 - 1987 | 17.38                                     | 46.89  | 35.89  | 15.92                                       | 39.41  | 26.11  | 56.11                  | 716.82  |
| 1988 - 1995 | 17.56                                     | 49.43  | 33.05  | 16.65                                       | 42.74  | 26.12  | 54.83                  | 697.90  |
| 1996 - 2003 | 16.46                                     | 50.83  | 32.71  | 15.10                                       | 49.48  | 28.76  | 57.98                  | 725.72  |
| 2004 - 2011 | 13.51                                     | 50.53  | 35.86  | 13.13                                       | 53.23  | 34.33  | 69.06                  | 861.12  |
| 2012 - 2015 | 12.98                                     | 58.12  | 34.66  | 15.03                                       | 59.87  | 24.53  | 59.26                  | 959.93  |
| 1980 - 2015 | 15.87                                     | 50.39  | 34.41  | 15.18                                       | 47.73  | 28.35  | 59.47                  | 773.67  |

Source: Author's computation using World Development Indicators (WDI).



Source: Author's computation using World Development Indicators (WDI).

Figure 2.1: Trends of sectoral value additions

Figure 2.1 shows line plots of the value additions of the various sectors of the economy in Africa. From the Figure, it is evident that there is an unabated growth in the service sector relative to the other sectors. The service sector increased from 44.17% in 1980 to its all–time highest of 55.36% in 2011 while value additions in the other three sectors decreased over the same period.

### 2.4 Conclusion

This chapter presents brief stylized facts on financial development, international trade and sectoral value additions in Africa. It is observed that domestic financial development remains underdeveloped although there are reforms to spur finance. Indeed, African economies are opened to international trade on the back of improved sectoral growth with the service sector being the dominant sector. While anecdotal evidence suggests linkages among financial development, sectoral value additions and international trade, the next chapter presents a review of the literature on these indicators.

### **CHAPTER THREE**

#### LITERATURE REVIEW

#### 3.1 Introduction

This chapter presents a review of both the theoretical and empirical literature in order to appreciate previous studies on financial development–international trade nexus while highlighting their key findings after identifying the gaps.

### **3.2** Theoretical Literature

Grossman and Helpman's (1991) theoretical model predicts that trade openness improves the transfer of new technologies and ideas, facilitating technological progress and productivity. However, these positive gains from trade are conditioned on the level of trade openness. To them, trade presents clear economic incentives capable of raising productivity via two channels at different time periods. First, in the short run, trade limits the rate of resource misallocation. Second, by engaging in trade, there is higher technological spill-over. By increasing market size, international trade enables economies to enjoy the potential benefits of increasing returns to scale and economies of specialization (see Alesina, Spoloare & Wacziarg, 2000).

Beyond this, the endogenous growth models opine that the growth effect of international trade is not homogenous but contingent on the relative effect of comparative advantage and competitive advantage (Porter, 1990). This leads economic resources toward activities that create long run growth and value as well as boosting cross-border trade. Furthermore, the endogenous growth models also postulate that, largely on account of constraints in
technology and finance, underdeveloped economies may lack the capacity to adopt technologies used in the developed economies. Thus, the impact of trade on overall economic value additions may vary given the level of countries' economic development. Notwithstanding this, some studies have argued that trade may inhibit economic growth (see Redding, 1999 & Lucas, 1988). The argument is that, if an economy specializes in sectors with dynamic comparative disadvantage in terms of productivity growth or where technological innovations are greatly exhausted, long run economic progress may suffer.

By using an augmented Heckscher–Ohlin model, Kletzer and Bardhan's (1987) theoretical model reveals that well–developed financial sector can lead to a comparative advantage in industries that rely more on external financing leading to improved transnational trade. In their model, financial sector development decreases the search costs, thus raising the level of external finance. In this case, the banking sector development may shift incentives of producers toward goods with higher returns to scale for exports and hence, the inter-sectoral specialization in production processes as well as the structure of international trade flows explained by the relative level of access to finance. Their model concludes that, countries with well–developed financial systems are net exporters of the goods on the back of higher scale of economies all things being equal.

Beck (2002) extended Kletzer and Bardhan (1987) theoretical work by allowing sectors to depend on external finance, one being more credit intensive due to increasing returns to scale. Beck's (2002) model explicates one channel through which the level of finance influences production decisions and both the level and structure of international trade. In their model, financial development benefits producers of a good with increasing returns to scale. This results in a higher production and trade balance of goods in total output in economies with well–developed financial systems.

Building further from the above understanding, Rajan and Zingales (2003) suggest that vested interest groups such as incumbents who feel endangered by the opening up of the financial system have a strong incentive to resist entry and also resist the development of the financial system in order to protect incumbents' interest. The authors argue that when a country simultaneously de-restricts its borders by way of opening up to international trade and capital flows, such country is more probable to benefit from trade openness as it potentially triggers competition and threatens the vested interest of the incumbents. Rajan and Zingales (2003) hypothesize that simultaneous opening of the trade and capital accounts potentially decreases incumbents' powers to block financial development and might even create sufficient new profits that exceeds the deleterious effects of increased competition on incumbents thus reducing the opposition to financial reforms.

### **3.3 Empirical Literature**

This section, which discusses the empirical review of the literature, is divided into three parts. The first part presents an empirical review of the relationship between financial sector development and international trade while the second section reviews the threshold effects of financial development on trade. In the third section, there is an empirical review of the linkages among financial development, sectoral value additions and international trade.

### 3.3.1 Financial development-international trade nexus

Existing empirical literature has largely studied the impact of international trade on economic growth (see for instance Harrison, 1996; Shaheen et al., 2011; Asfaw, 2014; Adeleye et al., 2015; Rahman et al., 2015) albeit mixed findings. For instance, Fosu (1990) observes that international trade proxied by exports positively impact on economic growth based on a sample of 28 less developed countries in Africa. Onafowora and Owoye (1998) find similar

results relying on a sample of 12 sub–Saharan African (SSA) countries. Deme (2002) validates the trade–led growth hypothesis for Nigeria. Keho's (2017) study in Cote d'Ivoire find economic growth–enhancing role of trade openness in both the short and long run. Beyond this evidence, the authors also observe a strong complementary relationship between trade openness and capital formation in spurring economic growth. Using a sample of 34 African countries, Vlastou (2010), however observes a negative and significant effect of international trade on long run economic growth. Similar evidence was also found by Polat, Shahbaz, Rehman and Sattis (2015) in South Africa, Musila and Yiheyis (2015) in Kenya and Shaheen et al. (2011) in Pakistan over the period 1973–2009. Recently, Lawal, Nwanji, Asaleye and Ahmed (2016) apply the Autoregressive distributed lag (ARDL) approach to co-integration and observe that, the impact of international trade on economic growth is time–specific.

Aside the impact of international trade on economic growth, early writers find evidence that financial sector development spurs economic growth through international trade (see for instance Schumpeter, 1911; Patrick, 1966). However, empirical literature on financial development–economic growth nexus is largely understood on direction of effect (De Gregorio and Guidotti, 1995; Levine et al., 2000; Masten et al., 2008; Khan, 2008; Mishra & Narayan, 2015), causal relations (Abu–Bader & Abu–Qarn, 2008; Odhiambo, 2004). It is imperative to note that, most of the panel and cross–section studies (Khan, 2008; Khan & Senhadji, 2000; King & Levine, 1993; Levine et al., 2000) also find support for the positive relationship between financial development and economic growth.

By using gross domestic savings to proxy financial deepening, Hassan, Sanchez and Yu (2011) find a positive long run effect of financial development on economic growth in all regions of the globe. They argue that a well–developed financial sector significantly propels

overall economic growth through its impact on savings and investment. Conversely, by using private credit provided by the banking sector as an indicator of finance, Hassan et al. (2011) observe a negative link between financial development and economic growth in high income countries. While this finding is particularly inconsistent with Levine et al. (2000), Hassan et al. (2011) argue that private credit is only a suitable proxy for financial development in developing countries and not in developed countries since developing countries are more into building their banking sector relative to developing their capital markets. Uddin, Sjö and Shahbaz (2013) re–examine the nexus between financial development and economic growth in Kenya over the period of 1971–2011 and established that, in the long run, the development of the financial sector has a positive impact on economic growth.

Ibrahim and Alagidede (2016) construct a panel dataset of 29 SSA countries for the period 1980–2014 to examine the effect of finance on economic growth when financial sector growth outstrips the solvency needs of the real sector. They find that, while financial development supports economic growth, the extent to which finance helps growth crucially depends on the simultaneous growth of real and financial sectors and argue that changes in either size of the real sector or financial sector are higher under balanced sectoral growth.<sup>1</sup>

By relying on exports and imports as indicators of international trade, Savvides (1995) finds a positive impact of international trade on economic growth in Africa. Yanikkaya (2003) proxies trade by the amount of trade volumes and trade restrictions and found economic growth-enhancing effect of trade via technology transfers, scale economies and comparative advantage. Rahman et al. (2015) investigates the relationship among financial development, international trade and economic growth in Australia over the period of 1965–2010 and finds

<sup>&</sup>lt;sup>1</sup> Empirical literature on finance–growth causality is also mixed (Ghirmay, 2004; Christopoulos & Tsionas, 2004; Odhiambo, 2004; Khan, 2001; Atindehou et al., 2005).

evidence of co-integration suggesting the existence of a positive long-run relationship among the variables financial development, international trade and economic growth.

Apart from the relationship between (i) international trade and economic growth and (ii) financial development and economic growth, few studies attempted to examine how financial development and international trade play out. Literature on finance–trade nexus is gradually emerging (see Baltagi et al., 2009; Kim et al., 2010a, b).

With regard to the relationship between domestic financial development and international trade, Beck (2002) relies on Kletzer and Bardhan (1987) theoretical model to empirically examine the link between financial development and international trade where the latter is proxied by the level of exports of manufactured goods using a panel dataset of 65 countries over the period 1966–1995. After controlling for biases introduced by country–specific effects, reverse causality and simultaneity, their results show a statistically significant and economically large impact of finance on trade. Interestingly, these findings are robust and consistent across countries and panel estimations. It was found that countries with a well-developed financial systems have a higher export share and positive trade balance in manufactured goods (Hur et al., 2006).

In extending the literature of finance–trade argument, Hur et. al. (2006) examine how the interrelationship between a country's financial sector development and firms' asset tangibility influences the international trade flows of different industries and used data for 27 industries in 42 countries<sup>2</sup> to test the hypothesis that countries with higher (lower) level of financial development will have higher exports share and trade balance in industries with less (more) tangible assets. They found that countries with relatively well-developed financial sectors

<sup>&</sup>lt;sup>2</sup> Only one African country (Kenya) was part of their sample.

have a comparative advantage in industries characterized by more intangible assets while countries with a poorer financial sector development have a comparative advantage in industries characterized by tangible assets. Specifically, firms located in countries with lower level of financial market development require tangible assets to allow access to external financing. This is because the extent of moral hazard and adverse selection problems between lenders and borrowing firms tend to be more pronounced in such countries relative to those with well-developed financial systems. In this way, risk of default is higher. Their findings provide evidence that improvement in domestic financial systems spurs international trade pattern of the manufacturing sectors.

Gries, Kraft and Meierrieks (2009) test for causality between financial deepening, trade openness, and economic development for 16 SSA countries using the Hsiao-Granger approach. Their findings appear to confirm the existence of a relationship between financial development and trade openness albeit mixed. For instance, the authors find evidence of finance-trade for Gabon, Kenya, Nigeria, and Sierra Leone, while in the case of Sierra Leone, the evidence does not indicate a stable long-run causality. Further findings also reveal that trade openness has unilaterally influenced financial depth in Ghana, Madagascar, and Rwanda, where for Rwanda.

Kim et al. (2010a) found that a positive long-run effect of trade coexists with a negative short-run effect in relatively lower-income countries, trade openness tends to have negative long-run and insignificant short-run effects on financial development in high-income economies and observe that the trade–finance nexus is contingent on the level of inflation. While the coexistence of positive long-run and negative short-run effects holds for high-inflation countries, the effects of trade are mixed for lower inflation groups.

Kim et al. (2012) investigate the interactions between financial development and trade openness through simultaneous equation systems using data of 63 countries (including some countries in Africa) over the period 1960–2007. Results from their study show a positive impact of financial development on international trade and a negative effect of trade on financial sector development in poorer countries. However, in richer countries, financial development stimulates trade openness whereas international trade has an ambiguous impact on financial development.

Winters and Masters (2013) surveyed empirical literature on trade openness and financial development. The authors argue that although earlier studies emphasized on exports as a measure of trade, subsequent literature has also revealed that trade (both imports and exports) are crucial for financial development and economic progress. Indeed, empirical studies on this are also mixed while Rodrik (1999) argues that the differences in findings may partly be attributed to the different measures of trade, methodology or settings.

### 3.3.2 Threshold effects of financial development and international trade

International trade is potentially associated with extra upfront expenditures that make production for international markets expensive and more dependent on external financing than producing for the home country. According to Manova (2013), these sunk and fixed costs of cross–border trade includes learning about the profitability of potential export markets; making market–specific investments in capacity, product customization and regulatory compliance; and setting up and maintaining foreign distribution networks. Variable trade costs comprise shipping, duties, and freight insurance. With regard to domestic operations, majority of these expenses are pre–financed prior to receipt of export revenues. To finance these costs, exporters typically rely on banks and other financial institutions.

Thus, a well-developed domestic financial sector is crucial for firms' ability to finance their international trade activities.

Countries with well-developed financial systems enjoy a comparative advantage and export relatively more (Rajan & Zingales, 1998). The theoretical link on financial development and international trade provide evidence that financial development increases the amount that firms can borrow, allowing them to operate at a higher scale and to afford the export entry cost, thereby increasing the returns to exporting and the trade share. However, firms with cash constraints and those with sufficiently low net worth cannot afford to finance the initial investment and sunk costs that come with export entry relying on the external and internal funds available. Manova (2013) theoretical model shows that limited financial development does not only confine trade by decreasing output, but it also interrupts trade by preventing potentially profitable firms from exporting and constraining exporters' sales abroad. The author opines that credit conditions are as crucial for international trade as traditional Heckscher–Ohlin sources of comparative advantage and Porter's (1990) competitive advantage.

Manova (2013) also developed a heterogeneous–firm model with cross–country differences of financial development in examining how financial market imperfections distort international trade by decomposing the effect into three channels namely (i) the selection of heterogeneous firms into domestic production, (ii) the selection of domestic manufacturers into exporting, and (iii) the level of firm exports. Leibovici (2016) investigates the industry–level and aggregate implications of financial development on international trade by relying on a standard general equilibrium trade model under financial market frictions. In the model, financial frictions lower trade through two channels. First, relative to non–exporters, financial

frictions distort production decisions of exporters thus decreasing the proportion of output sold at the international markets. In the model, even though both non–exporters and exporters have reduced scale of production as a result of limited capital that can be externally financed, exporters are distorted relatively more because they inherently have higher optimal scale. Frictions in the financial sector thwarts entry of firms into the export sector thus deferring firms' export entry until sufficient financial resources are accumulated to engage in such investment. As a consequence, financial friction – a characteristic of financial sector under–development – decreases the export share of firms hence the overall share of output sold at the international markets are lower.

Interestingly, while international trade enables technology adoption and diffusion which is healthy for overall economic progress, low financial sector development may weaken less developed economies from fully enjoying the benefits of trade. To this end, there should be a threshold at which point the impact of financial development can be realized on international trade. To the extent that advanced economies tend to have well developed and matured financial systems, it implies that countries below a certain threshold level of financial development may be unable to effectively leverage on their domestic financial sector to improve on international trade. Understanding the optimal threshold for the countries under consideration is important in order to be able to plan financial development policies within that framework (see for instance Huang & Lin, 2009; Cecchetti & Kharroubi, 2012; Shen & Lee, 2006 who found thresholds in their various studies). Accordingly, if such a nonlinear relationship exists, then there is a possibility to estimate (i) the optimal level of financial development at which the finance–trade effect switches signs and (ii) the impact of finance when countries are below or above the threshold. Notwithstanding the theoretical evidence, empirical studies on financial sector development effect on international trade have not been

rigorous and the findings are mixed. Apart from that, much of the empirical studies have focused on the optimal level at which the impact of trade is realized on economic growth. Samargandi et al. (2015) argue that the points of inflection of finance–growth are generally lower in middle–income countries. These findings are however inconsistent with Adeniyi, Oyinlola, Omisakin and Egwaikhide (2015). Using Nigeria as a case study and including a quadratic square term of financial development in their Autoregressive Distributed Lag (ARDL) growth model, Adeniyi et al. (2015) found a U–shaped nexus suggesting that financial development decreases economic growth up to a certain threshold above which economic growth increases with increasing financial development. The divergence which Ibrahim and Alagidede (2016) attribute to Adeniyi et al. (2015)'s use of single country does not reflect the entire region on account of the rather small sample.

Building further from that, Kim and Lin (2009) find that the growth effects of trade openness vary according to the level of economic development. Higher trade openness strongly enhances economic growth of developed countries while decreasing both growth and real income for less developed countries.

Zahonogo (2016) investigates how trade openness affects economic growth in SSA by invoking the pooled mean group over a sample of 42 countries spanning 1980–2012. Their evidence suggests that, the relationship between trade and economic growth is nonlinear. Specifically, Zahonogo (2016) finds an inverted U–shaped nexus which is robust to indicators of trade and model specifications. For instance, where trade is respectively proxied by trade openness, export share, and import share, the inflection points are 134.21%, 155.68% and 33.16%, respectively.

Beyond trade–growth relationship nexus, few notable studies have investigated the relationship between finance and trade. For instance, Kim et al. (2010a) employs the Pooled Mean Group (PMG) approach to study the dynamic effects of trade openness on financial development for 88 countries over 1960–2005. Their results reveal that, financial development and international trade are co-integrated and thus mean revert to non–spurious long run relationship. Interestingly, they find that trade–finance linkage varies with the countries' stage of economic development. While a positive long run effect of trade coexists with a negative short run effect in relatively lower income countries, trade openness negatively influences long run financial sector development and an insignificant short run effect in high–income economies. Using inflation as a regime–trigger, Kim et al. (2010a) observe that while the coexistence of positive long run and negative short run effects holds for high–inflation countries, the impact of trade is however mixed for lower–inflation groups.

Following this, Kim et al. (2010b) study the long–run and short–run relationships between financial development and trade openness. Using the unbalanced panel data for 87 countries (including some African countries) over the period 1960–2005, evidence from their threshold analysis suggests a nonlinear long run relationship where trade decreases with financial development. These findings suggest that the long–run effect of financial development on international trade is higher in less financially developed countries but diminishes with financial deepening. This is similar to Masten et al. (2008). The authors find that, the positive growth effect of financial development is huge in countries that are relatively under– developed financially, but wanes when the financial development exceeds a certain threshold.

Efficient financial intermediaries and markets may offer crucial information about profitable ventures and comparative advantage, diversify risks, ameliorate information asymmetry and

facilitate resource mobilization. Thus, well-developed financial systems aid in capital formation and the efficiency at which resources are allocated as well as cross-border financial transactions thereby promoting international trade. Empirically, Gächter and Gkrintzalis (2017) examine the role of nonlinearities in the finance-trade nexus relying on panel data spanning 1960–2011 and find a trade–enhancing effect of finance. By including a quadratic term of finance in the trade equation, Gächter and Gkrintzalis (2017) observe a much stronger effect of finance on exports. Further evidence from their dynamic panel estimations qualitatively confirms the results. Against the backdrop of a significantly positive coefficient of financial development, but a significantly negative coefficient on the squared term, the authors conclude that finance-trade link is non-monotonic and inverted U–shape in particular with inflection points of private credit to GDP of 115% for exports. Thus, higher finance beyond the threshold is not good for trade.

So far, the literature on thresholds of finance-trade nexus has not been rigorous in investigating the mediating role of finance as a threshold variable in influencing the impact of finance on international trade. For instance, the effect of financial development on international trade may be a consequence of the level of the countries' domestic financial sector. Despite the promising evidence projecting the critical role of domestic financial development on the African continent in recent years, empirical efforts (such in Beck, 2002; Hur et al., 2006; Kim et al., 2012; Kim et al., 2010a; Kim et al., 2010b) have not been indepth in investigating these effects. Although the relationship between financial development and trade, theoretically suggests a positive link, the related empirical findings are rather mixed (see Beck, 2002; Hur et al., 2006; Kim et al., 2006; Kim et al., 2010b; Svaleryd & Vlachos, 2002), and most of the studies largely ignored possible nonlinearities in the relationship between finance and international trade. Even the few existing literature relied on approaches where an

exogenous quadratic term is introduced in the trade equation. However, such approaches are not instructive and do not reveal several distinctions in the threshold effects of finance. In this study, the researcher aims to fill this important gap in the literature by thoroughly investigating nonlinearities in the association between financial development and international trade using a robust technique involving the application of Hansen (2000) sample splitting estimation approach that permits the determination of a threshold within a clearly defined confidence interval. This technique also reveals the effect of finance-trade nexus below and above the threshold in which the traditional approaches are unable to do.

### 3.3.3 Financial development, sectoral value additions and international trade

Recent studies on the relationship between financial sector development and economic growth suggest that, well-developed domestic financial sector spurs economic growth through efficient allocation of resources, monitoring investment, trading and risk diversification, mobilizing savings, exerting sound corporate governance, amelioration of information asymmetry among others (King & Levine, 1993; Levine, 1997; 2005; Ibrahim & Alagidede, 2016).

Apart from financial development, cross-border trade has become an essential tool attracting the interest of many researchers. Indeed, several studies (see for instance, Rajan & Zingales, 2003; Braun & Raddatz, 2005; Do & Levchenko, 2007) have argued that international trade is strongly related to countries' domestic level of financial development. The reason is that, if higher international trade spurs economies' exposure to the vagaries of the world market, then well-developed domestic financial sector acts as a powerful insurance instrument that dampens barriers to trade. Feeney and Hillman (2004) established how capital market incompleteness affects trade. They argue that, there is no inducement for special interest

groups to lobby for protection if risks can be fully diversified. Therefore, improvement in the financial sector will in a way eliminate information asymmetry and rigidities that could potentially hurt higher trade flows between and among countries.

Some extant literature in finance-trade nexus also opines that development of local financial sector is a potential source of comparative advantage for countries (see for instance Kletzer & Bardhan, 1987 & Beck, 2002) and as a consequence fulfills the rule of competitive advantage. Svaleryd and Vlachos (2002) examine the relationship between financial development and trade relying on a dataset of 80 countries spanning over the period 1960–1994. Results from their cross-sectional and panel estimations reveal an economically significant nexus between trade and financial markets with causality flowing in both directions. Their panel estimations also show a strong positive relationship between trade and finance even after controlling for both time-specific and fixed country effects.

Rajan and Zingales (2003) find that countries openness to international trade improves domestic financial development by waning the influence of economic and political incumbencies that inhibit financial liberalization. However, relying on 88 countries (including some countries in Africa) over the period 1960–2005, Kim et al. (2010a) examine the impact of trade openness on financial development. Their main conclusion is that while trade may improve on finance, their effect varies depending on countries' level of development. Specifically, for high income countries, finance–trade nexus is insignificant in the short run and in the long run; higher trade openness hurts financial development. For lower income economies, the impact is positive in the long run and negative in the short run.

Kim et al. (2010b) investigate the long and short run relationships between financial development and international trade using a panel data for 87 OECD and non-OECD countries over 1960–2005. The authors find a positive (negative) long (short) run nexus between trade and finance suggesting that, in the long run, finance and trade are complements. However, after splitting the sample into OECD and non-OECD countries, these findings only hold for the non-OECD countries where majority of the African countries fall. For the OECD countries, financial development has insignificant effect on trade. The main impulse of Kim et al. (2010b)'s study is that, the overall effect of finance on international trade is country-specific. Kim et al. (2012) further find a positive impact of financial development on trade whereas the effect of trade on financial development is unclear for a sample of 63 countries over the period 1960–2007.

Indeed, from the foregoing, empirical literature on finance–trade nexus has centered on the impact of finance (trade) on aggregate trade (finance) without examining how domestic financial development and the sectoral value addition play out in trade flows especially from the developing countries perspective and Africa in particular. A few notable studies have investigated the relationship between finance and trade. For instance, Kim et al. (2010a) employs the PMG approach to study the dynamic effects of trade openness on financial development. Their results reveal that, financial development and international trade are co-integrated and thus mean revert to non–spurious long run relationship. While a positive long run effect of trade coexists with a negative short run effect in relatively lower income countries, trade openness negatively influences long run financial sector development and an insignificant short run effect in high–income economies. Using inflation as a regime–trigger, Kim et al. (2010a) observe that while the coexistence of positive long run and negative short run effects holds for high–inflation countries, the impact of trade is however mixed for lower–inflation countries.

Kim et al. (2010b) also found that long-run complementarity between finance and international trade coexists with short-run substitutability between the two. In particular, the long-run coefficients of finance are positive and significant for low- and medium-financially developed countries and insignificant for well-developed financial countries, irrespective of the indicator of finance. This is similar to Masten et al. (2008), who find that, the positive effect of financial development is huge in countries that are relatively under-developed, but wanes when the financial development exceeds a certain threshold.

More tellingly, beyond these traditional studies involving the unconditional effect of finance, what are the indirect effects of finance at the sectoral levels? Studies on the transmission channels of finance are scanty although few are notable. In the foreign aid literature, Kumi, Ibrahim and Yeboah (2017) examine the interrelationships among aid, aid volatility and sectoral growth and how domestic financial development shape volatility–sectoral value addition nexus in SSA over the period 1983–2014. Their results reveal three key findings. First, while financial sector development significantly drives value additions in agriculture, service and manufacturing sectors, its effect is only imaginary in the agricultural sector. Second, while aid improves on sectoral growth, aid volatility weakens sectoral value additions impacting heavily on non-tradable sectors with no apparent effect on the agricultural sector. Third, the negative impact of aid volatility on sectoral value additions in SSA is dampened by a well-developed financial system with significant impact on the tradable sector.

Becker and Greenberg (2004) explore the linkage between exports and financial development and opine that exporting firms are faced with significant upfront fixed cost in the product design, production, marketing and transportation and this is influenced by the level of financial development. Empirically testing their hypothesis reveals that the marginal impact

of finance on exports is higher for industries and country pairs facing heavy upfront investment largely driven by either product features or economic distance between the importer and exporter.

Using annual bilateral export data on agricultural and manufacturing products for 49 countries over the period 1980–2008, Susanto et al. (2011) empirically investigate the link between financial development and trade flows. They find that domestic financial systems influence bilateral trade flows. Following Beck (2002), Susanto et al. (2011) rely on two sectors (manufacturing and agriculture) with different levels of economies of scale in analyzing how these sectors respond to changes in financial development. On the whole, their findings show that well-developed financial sector positively and significantly affect bilateral trade flows with the manufacturing sector enjoying a larger effect relative to the agricultural sector. However, after disaggregating the data along regional lines, finance–sectoral effects differ. For the most part, developing countries including those in SSA reap greater benefits of financial development on exports in both sectors than the developed economies.

At the firm-level, Berman and Héricourt (2008) hypothesizes that the level of financial development does not only affect firms' export decisions but also the quantity exported by firms. Relying on a large cross-country firm level data in developing and emerging economies, the authors found that financial restraints generate a gap between firms' productivity and their exports. More specifically, results from their study suggest that, higher financial development spurs the number of exporters and this affects exporters' selection process by dampening such a gap between productivity and level of exports.

Using a firm-level data for the Belgian manufacturing sector, Muûls (2008) assesses export behavior of firms. The author concludes that firms have higher inclination to export more

once they face lower credit constraints and as well enjoy higher productivity. Thus, credit constraints and financial underdevelopment significantly matter for export patterns.

Manova (2008) presents an integrated model of international trade with firm heterogeneity and financial market imperfections. The author shows that credit constraint interacts with firm heterogeneity and reinforces the selection of only the most productive firms into exporting bilaterally. Manova (2008) further finds that private credit significantly influences trade proxied by bilateral exports. More importantly, the study suggests that weak financial institutions generate trade distortions, especially in financially vulnerable sectors with trade distortions emanating from fewer destination markets, reduced export product variety and lower aggregate trade volumes. Thus, developing countries that typically rely on trade for growth suffer in the face of weak financial sector.

Indeed, from the discussions above, it is clear that literature examining the impact of finance on trade through its effect on the various sectors of the economy is very limited. Ibrahim and Alagidede (2016) argue that financial development hampers economic growth when the improvement in the financial sector is unaccompanied by higher real sector growth proxied by industrial sector value additions where higher growth is achieved under balanced sectoral growth. Notwithstanding these studies, what is unknown is how financial sector development impacts on trade through the various sectors of the economy namely agriculture, industrial and service sectors. Beck (2002), Hur et al. (2006), Susanto et al. (2011) and Kim et al. (2012) study economic growth and sectoral value additions interacted with domestic financial sector promotes or inhibits trade in Africa. Thus, results produced by earlier literature are not instructive and therefore present unclear conclusion for policy. To the extent that improving international trade by boosting sectoral value additions and financial sector is one of the

major preoccupations of many countries in Africa, trade–sectoral growth–finance nexus needs far more understanding and in-depth analysis. Using recent data, this study aims to uncover the precise sectoral transmission channels through which domestic financial sector impact on trade in Africa and as well examine both the short and long run effects of this relationship by applying the pooled mean group estimation approach. From a policy perspective, efforts targeted at reforming domestic financial sector may have important implications for each sector and ultimately trade if the level of finance is a critical driver of economies' comparative and competitive advantages.

From the foregoing, this study is inspired by the works of Kletzer and Bardhan (1987) and Beck (2002). In this sense, we aim to explore the theoretical linkage in finance–trade nexus. Empirically, existing studies have failed to (i) re–examine the impact of financial development on international trade given the level of economic growth (ii) threshold effects of trade–finance nexus mediated by the countries' levels of finance, as well as (iii) sectoral effects of finance in international trade in addition to the role of finance in sectoral value addition–trade linkage. This study hopes to fill these gaps in the literature.

### 3.4 Conclusion

The chapter reviews both the theoretical and the empirical literature on finance – international trade relationship. These theories linking finance and trade have revolved around comparative and competitive advantage, Heckscher–Ohlin's theory and vested interest groups (incumbents) blocking financial development. The theories so far support a clear positive linkage between financial development and international trade. The empirical literature, however, shows mixed finding on the link among financial development and

international trade. It also unearths important gaps in finance-sectoral value additions and international trade nexuses that the present study aims to address by first discussing the methodology in the next chapter.

### **CHAPTER FOUR**

### METHODOLOGY

### 4.1 Introduction

In this chapter, there is a discussion of the source and scope of the data. It also discusses all the data variables used in estimating the models. In addition, we present the model specifications in the quest to achieve the objectives of the thesis.

### 4.2 Data Sources and Scope

In the quest to address objective one and three, we construct annual panel dataset of 46 countries over the period spanning 1980–2016,<sup>3</sup> while switching to time series data in addressing objective two because the analysis of this objective is based on individual countries. The countries are Algeria, Angola, Benin, Botswana, Burundi, Burkina Faso, Cape Verde, Cameroon, Central African Republic, Chad, Congo Democratic Republic, Congo Republic, Cote d'Ivoire, Ethiopia, Egypt Arab Republic, Equatorial Guinea, Gabon, Ghana, The Gambia, Guinea-Bissau, Guinea, Kenya, Liberia, Libya, Lesotho, Mali, Malawi, Mauritania, Mauritius, Morocco, Niger, Nigeria, Namibia, Mozambique, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe. Selection of these countries is entirely based on data availability for longer time period particularly for the variables of interest such as international trade, financial development and sectoral value additions. All the data used in this study were sourced from the World Development Indicators (WDI) of the World Bank.

<sup>&</sup>lt;sup>3</sup> However, data for the next chapter spanned from 1980–2015 to allow complete data averaging.

### 4.3 Data Description

### 4.3.1 Financial development

We measure financial development by private sector credit as percentage of GDP which has been extensively used in the finance literature (King & Levine, 1993; Levine et al., 2000; Ibrahim & Alagidede, 2016; Ibrahim & Alagidede, 2017a, b; Ibrahim & Alagidede, 2018). This indicator measures credit advanced to the private sector, thus capturing the utilization and allocation of funds to more efficient and productive activities. It particularly separates credit to the private sector from those issued to governments, government agencies, and public enterprises. It also excludes credit by the Central bank.

Apart from private credit, the study also used domestic credit provided by the financial sector (as a percentage of GDP) to proxy financial development. This measure refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non–equity securities, and trade credits and other accounts receivable that establish a claim for repayment. In addition, it includes credit to the private sector with those issued to governments, government agencies, and public enterprises. It also includes credit by the Central bank. These indicators thus have clear advantage over measures of monetary aggregates, in that it more accurately represents the actual volume of funds channeled to the private sector. Therefore, the ratio of private and domestic credits to GDP are more directly linked to overall trade. However, it is assumed that banks are not subject to mandated loans to priority sectors, or obligated to hold government securities, which may not be suitable for developing countries such as those in Africa because the continent's financial sector is heavily bank-based and are sometimes obligated to hold government securities and lend to priority sectors (Hassan et al., 2011). In bank–based financial sectors such as those in Africa, relative to domestic credit, private credit is the most important financial efficiency indicator

and measures the extent to which private firms with sound investment projects obtain bank financing (Rajan & Zingales 2003; Baltagi et al., 2009).

### 4.3.2 International trade

The study proxies international trade using two variables: trade openness and exports. Trade openness is measured by the sum of exports and imports of goods and services as a share of GDP. This measure has been used extensively in the literature (see Yucel, 2009; Kim et al., 2010a; Menyah et al.+, 2014; Gries et al., 2009; Zahonogo, 2016) to measure countries' openness to the international markets. For robustness analysis, we also measure trade by the volume of exports of goods and services. This measure of trade has also been used in earlier studies (see for instance Fosu, 1990; Zahonogo, 2016; Sakyi & Egyir, 2017) to proxy international trade.

#### 4.3.3 Sectoral value additions

We chose three sectors which include agriculture, service and industrial sectors. Following earlier studies (Ductor & Grechyna, 2015; Ibrahim & Alagidede, 2016; Kumi et al., 2017), we use their respective value additions to proxy each sector. On this basis, agriculture sector is proxied by its value addition defined as net output of the sector (after adding up all outputs and subtracting intermediate inputs). The service sector value addition includes value addition in wholesale and retail trade (including hotels and restaurants), transport, professional, and personal services such as education, health care, and real estate services. The industrial sector is measured by its value addition in mining, construction, electricity, water and gas and comprises of all net output less intermediate inputs. It also includes the manufacturing sub sector.

### 4.3.4 Control variables

We include control variables which are chosen following the extant literature. They are economic growth, inflation, government expenditure, secondary school enrolment, investment, labour and domestic savings. Economic growth is proxied by real GDP per capita growth measured in U.S. dollars. This is used to also measure the size of the domestic markets. Inflation is measured as the annual percentage change of the consumer price index (2010=100) which reflects changes in the cost to the average consumer of acquiring a basket of goods and services. This was used to denote macroeconomic (in)stability. Secondary school enrolment is used to denote the stock of human capital accumulation which is taken as the total enrolment in secondary education, regardless of age and expressed as a percentage of the population of official secondary education age. This is measured as a percentage of gross enrolment.

Gross fixed capital formation as a percentage of GDP is taken to proxy investment rates. Government expenditure also expressed as a percentage of GDP measures final government consumption expenditure and used to measure government size. Labour is proxied by the percentage of economically active population aged 15 to 64 years while gross domestic saving is calculated as gross national income less total consumption, plus net transfers expressed as a proportion of GDP. Indeed, these control variables have been chosen following several studies (see Beck, 2002; Hur et al., 2006; Kim, 2011; Kim et al., 2010b; Menyah et al., 2014) on the determinants of international trade.

### 4.4 Model Specifications

Given the unique requirement of each of the three research objectives, the study relies on three different estimation approaches and as such discusses each one of them below.

43

### 4.4.1 Objective one

This objective seeks to investigate the overall effect of financial development on international trade in Africa. In this endeavour, we exclusively rely on a panel dataset in examining financial development–international trade nexus because our focus here is on how financial development influences trade in the entire continent as a single unit of analysis. To empirically investigate the effect of financial development on trade, equation (4.1) is employed, where trade depends on finance and other covariates:

$$TR_{it} = f(FD_{it}, Z_{it}, \varepsilon_{it}) \tag{4.1}$$

$$i = 1, 2, \dots, N; \quad t = 1, 2, \dots, T,$$

where  $TR_{it}$  stands for indicators of international trade namely exports and trade openness of country *i* at time *t*;  $FD_{it}$  stands for indicators of financial development such as private and domestic credits;  $Z_{it}$  are the control variables including government expenditure, inflation, gross fixed capital formation, population, real GDP per capita, secondary school enrolment and gross domestic savings, subscripts *i* and *t* are country and time indices respectively while  $\varepsilon_{it}$  is the error term. Indeed, our control variables have also been used in several studies on financial development–international trade link (see Beck, 2002; Hur et al., 2006; Kim, 2011; Kim et al., 2010b; Menyah et al., 2014).

To examine whether financial development promotes or inhibits trade in Africa, we delineate a baseline model where trade is modeled as a function of its lag, finance and other control variables. Specifically, we estimate equation (4.2) below:

$$TR_{it} = \alpha_o TR_{it-1} + \alpha_1 FD_{it} + \alpha_2 Z_{it} + \epsilon_{it}$$

$$\tag{4.2}$$

 $\epsilon_{it} = \gamma_i + \mu_t + \varepsilon_{it}$ 

In this spirit,  $\alpha_o$  is therefore used to examine whether the continent's level of international trade diverges or converges to a common steady state;  $\gamma_i$  is the country–specific fixed effects;  $\mu_t$  is the time effects while  $\varepsilon_{it}$  is the error term assumed to be independently and identically distributed, *iid*  $N(0, \sigma^2)$ .

The study determines the threshold effect of financial development on international trade by including a quadratic term of financial development into equation (4.2) in order to examine possible nonlinearities in finance–trade nexus. The study does this by estimating equation (4.3):

$$TR_{it} = \beta_o TR_{it-1} + \beta_1 FD_{it} + \rho FD_{it}^2 + \beta_2 Z_{it} + \epsilon_{it}$$
(4.3)

In this estimation, the study sought to determine the nature of the threshold by relying on the sign of  $\beta_1$  and that of  $\rho$ , where U-shaped is expected. The exact value of the threshold is however determined by taking the first partial derivative of trade in equation (4.3) with respect to financial development and setting the result to zero in order to get the change in financial development with respect to the change in international trade.

Beyond the impact of financial development on international trade measured by  $\alpha_1$  in equation (4.2) and  $\beta_1$  in equation (4.3), the study also ascertain the channel through which finance affects international trade using economic growth as the main source. To examine how financial development influences international trade given countries' level of economic growth, there is an inclusion of a multiplicative interactive term of finance and economic growth, thus estimating equation (4.4) as follows:

$$TR_{it} = \varpi_0 TR_{it-1} + \varpi_1 FD_{it} + \eta FD_{it}^2 + \varpi_2 Z_{it} + \theta (FD_{it} \times EG_{it}) + \epsilon_{it}$$

$$(4.4)$$

where  $EG_{it}$  is economic growth for country *i* at time *t* while the other variables are as previously defined. From equation (4.4),  $\theta$  measures the impact of financial development on international trade given the countries' economic growth.

Indeed, the introduction of lagged dependent raises issues on endogeneity as the lagged dependent maybe correlated with the error term (Greene, 2003). In this study, we therefore estimate equation (4.4) relying on the system generalized method of moments (GMM) dynamic pooled estimator developed by Arellano and Bond (1991) and Arellano & Bover (1995). Relative to the conventional co-integration and ordinary least squares (OLS) estimations, the GMM technique corrects the econometric problems of endogeneity of the lagged dependent as well as the unobserved country–specific effects prevalent in panel estimations of this nature. From equation (4.2), a general system GMM framework is specified as follows:

$$TR_{it} = \sum_{k=1}^{p} \gamma_k TR_{it-k} + \alpha_1 FD_{it} + x_{it}\omega + \epsilon_{it}$$

$$t = p + 1, \dots, T; \quad i = 1, 2, \dots, N$$
(4.5)

where  $\omega$  is the regressors while p is the maximum lag in the model.

Estimating equation (4.5) in the face of endogeneity requires the error term to be uncorrelated with the regressors. This restriction, therefore, requires the use of instrumental variables which influence trade via their effect on the regressors. Thus, our set of regressors are weakly exogenous where current and past values of trade flows must not correlate with future realizations of the disturbance term.

To control for endogeneity in finance–trade relationship, Arellano and Bond (1991) proposed the use of lags of the explanatory variables as valid instruments. By selecting suitable lagged values of  $TR_{it}$  and  $x_{it}$  and assuming no correlation among them and the error term, the study sets out the following moment conditions for the difference GMM:

$$E\begin{bmatrix} \begin{pmatrix} TR_{it} \\ \vdots \\ TR_{it-p} \\ x_{it} \\ \vdots \\ x_{it-p} \end{pmatrix} (\epsilon_{it} - \epsilon_{it-p}) \end{bmatrix} = 0 \ t = 3; p \ge 2$$

$$(4.6)$$

Given the moment conditions specified in equation (4.6) above, the computation of the dynamic GMM estimator  $(\hat{\vartheta})$  is as follows:

$$\widehat{\vartheta} = \left[ \left( \sum_{i} \omega_{i}^{*|} J_{i} \right) \left( \sum_{i} J_{i}^{|} \beta_{i} J_{i} \right)^{-1} \left( \sum_{i} J \omega_{i}^{*} \right) \right]^{-1} \left( \sum_{i} \omega_{i}^{*|} J_{i} \right) \left( \sum_{i} J_{i}^{|} \beta_{i} J_{i} \right)^{-1} \left( \sum_{i} J_{i}^{|} c_{i}^{*} \right)$$
(4.7)

where  $\omega_i^*$  and  $c_i^*$  are transformations of  $\omega_i$  and  $c_i$  respectively;  $J_i$  is a matrix of instrumental variables while  $\beta_i$  is the country–specific weighting matrix (Ibrahim & Alagidede, 2016).

By assuming uncorrelated error terms and weak exogeneity property of the covariates, our GMM dynamic panel estimations make use of the following moment conditions under first difference:

$$E[TR_{it-p}(\Delta\epsilon_{it})] = 0 \text{ for } p \ge 2, t = 3, \dots, T$$

$$(4.8)$$

$$E[x_{it-p}(\Delta\epsilon_{it})] = 0 \quad \text{for } p \ge 2, t = 3, \dots, T$$

$$(4.9)$$

While first differencing resolves the country–specific effects, it is also not without flaws. More specifically, it has poor finite properties with regard to bias and precision particularly

when the covariates are persistent as their lagged values tend to be weak instruments (Blundell & Bond, 1998).

In this context, the study relies on the system GMM which uses a combination of the system regression in the first difference estimations and the regression in levels (Arellano & Bover, 1995; Blundell & Bond, 1998).

Blundell and Bond (1998) present evidence that the system GMM provides a better alternative to the first difference GMM as the instruments in the level equation are robustly good even when the endogenous variables are tenacious. However, utilizing the system GMM requires additional moments that leverages on the stationarity property of the variables (Blundell & Bond, 1998). The additional moment conditions for the regression in levels are therefore given as follows:

$$E[TR_{it-s} - (TR_{it-p-1}(\gamma_i + \epsilon_{it}))] = 0 \qquad \text{for } p = 1$$

$$(4.10)$$

$$E[x_{it-s} - (x_{it-p-1}(\gamma_i + \epsilon_{it}))] = 0 \qquad \text{for } p = 1 \tag{4.11}$$

Thus, relying on the moment conditions in equations (4.8), (4.9), (4.10) and (4.11) and employing the GMM technique produces consistent and efficient estimates.

In addition, the researcher uses 4-year data averaging to avoid biased estimates as well as abstracting from business cycle components eminent in the data. This exercise entails the construction of 4-year periods of data for each country (1980–1983; 1984–1987; 1988–1991; ......; 2008–2011; 2012–2015) yielding nine non-overlapping periods. Provided  $T \ge 3$  and N > T substantially as in the case where T = 9 and N = 46, the GMM approach is especially suitable as it provides key advantages in terms of accounting for potential

endogeneity of the regressors, simultaneity bias and possible autocorrelation stemming from the data (see Arellano & Bond, 1991; Bond, 2002; Baltagi, 2008; Roodman, 2009). However, the efficiency of the estimates depends on the validity of the instruments which the study examines relying on the serial correlation test and Sargan test for over-identifying restriction. The serial correlation test is used to examine whether or not the error terms are serially correlated at first or second order while the Sargan's test valuates the exogeneity of the instruments.

### 4.4.2 Objective two

Relative to objective one where a panel dataset is constructed to examine the overall effect of financial development on international trade in Africa using the entire continent as a single unit of analysis, this objective seeks to investigate for possible nonlinearities in financial development–international trade nexus for individual countries. To the extent that the focus of this objective is to treat individual country as a separate unit of analysis makes the panel data inappropriate hence the use of annual time series data to examine the possible thresholds and the impact of financial development on international trade. Indeed, a traditional technique to examining such threshold effect of financial development on international trade have involved introducing a quadratic term of financial development into the trade equation in addition to some controls (see for instance Gächter, & Gkrintzalis, 2017). Specifically, such a technique regresses the following equation:

$$TR_t = Y_o + Y_1 F D_t + Y_2 F D_t^2 + Y_3 X_t + \varepsilon_t$$
(4.12)

 $t = 1, 2, \ldots, T,$ 

where TR, FD and  $FD^2$  respectively denote indicators of international trade [exports and trade openness], financial development [private and domestic credits] and the square term of

financial development, respectively. The square term of financial development measures nonlinearity in trade–finance nexus;  $X_t$  is the control variables while  $\varepsilon_t$  is the error term and t is the time index.

This technique has been used to examine threshold effects of trade-economic growth (see Kim & Lin, 2009; Zahonogo, 2016) and finance-economic growth (see Ibrahim & Alagidede, 2016; Adeniyi et al., 2015). Conversely, apart from its imposition of exogenous nonlinearity, using this approach does not consider that the impact of financial development on international trade may well depend on an important factor like the level of countries' domestic financial sector development. For instance, country A's financial development may be extremely underdeveloped to exert any significant effect on international trade even if financial development increases by a unit-percentage. This study therefore departs from the earlier approach by employing Hansen's (2000) sample splitting approach which relies on asymptotic theory to estimate the threshold. This approach has also been used in examining the relationship between financial development and economic growth in SSA (Ibrahim & Alagidede, 2017) and fiscal policy and economic activity in developing countries (Slimani, 2016). The Hansen's (2000) sample splitting approach estimates the regression parameters by making use of the least square estimation which unearths the exact nature of the threshold in addition to revealing the statistical significance of all the thresholds identified. To apply this approach, we modify equation (4.12) such that the exact impact of financial development on international trade is mediated by the level of finance. In other words, relative to earlier studies on finance-trade nexus, this study argues that whether financial development promotes or hurts international trade flows depends on the level of a country's domestic financial sector development. Thus, our threshold value which is taken as a continuous distribution and the parameters estimated in equation (4.12). Following this, we estimate a two-regime threshold model in a single equation below:

$$TR_{t} = \begin{cases} (\alpha_{11} + \alpha_{21}FD_{t} + \alpha_{31}EG_{t} + \varepsilon_{t}) & \text{for } d_{t}\{q_{t} \le \eta\} \\ (\alpha_{12} + \alpha_{22}FD_{t} + \alpha_{32}EG_{t} + \varepsilon_{t}) & \text{for } d_{t}\{q_{t} > \eta\} \end{cases}$$
(4.13)

where *EG* is economic growth;  $d(\cdot)$  is the indicator function of dummy variable that takes the value 1 if the condition is satisfied and 0 otherwise; q is the threshold variable while  $\eta$  is the threshold value, subscript t as time index. The other variables are as previously defined.

This type of modelling approach permits the impact of financial development to differ on whether private and/or domestic credits are below or above some unknown threshold value of  $\eta$ . Thus, the level of financial development in equation (4.13) acts as sample splitting or threshold variable. On this score, the effect of financial development on international trade is respectively measured by  $\alpha_{21}$  and  $\alpha_{22}$  for a country with financial development below and above the threshold.

We limit the threshold value  $\eta$  to a bounded set,  $\eta \in [\underline{a}, \overline{b}] = \psi$  while using the concentration approach to estimate the least squares estimators where  $\hat{\eta}$  is the unique value that minimizes the Sum of Squared Errors (SSE),  $SSE_n(\eta)$  and can therefore be estimated as:

$$\hat{\eta} = \underbrace{argmin}_{\eta \in \psi_n} SSE_n(\eta),$$

where  $\psi_n = \psi \cap \{q_1, q_2, \dots, q_n\}$ .

Indeed, from equation (4.13), if  $\alpha_{21} = \alpha_{22}$  and  $\alpha_{31} = \alpha_{32}$ , the model reduces to a linear one. Therefore, as a first step in this approach, the researcher tests the hypothesis for the existence of thresholds. The null hypothesis  $H_0: \alpha_{21} = \alpha_{22}$  argues that the equation is linear against the alternative hypothesis ( $H_1: \alpha_{21} \neq \alpha_{22}$ ) of a threshold model. Under the assumption that the

error term is *iid*  $N(0, \sigma^2)$ , the hypothesis is tested using the Likelihood Ratio (*LR*) test statistic:

$$LR_n(\eta) = n \frac{SSE_n(\eta) - SSE_n(\hat{\eta})}{SSE_n(\hat{\eta})}$$

We reject the  $H_0$  for large values of  $LR_n(\eta)$  and by rejecting this hypothesis, we find evidence of a threshold. In this study, full nonlinearity (or threshold) is when a country exhibits a threshold for both proxies of finance at all the indicators of international trade. However, a country is said to exhibit an incomplete nonlinearity when there is evidence of threshold for at least one indicator of finance and international trade.

The validity of the threshold value,  $\eta$  depends on whether it lies within the confidence interval. Hansen (2000) note that using inversion of Wald test statistics is a common method to form a confidence interval for parameters. However, an important flaw of this approach is, "when asymptotic sampling distributions depend on unknown parameters, the Wald statistic can have very poor finite sample behaviour" (Hansen, 2000: 583). To avoid this weakness, Hansen (2000) constructs an asymptotic confidence region (c) based on the  $LR_n(\eta)$  which is fixed at  $\hat{\psi} = \{\eta: LR_n(\eta) \leq c\}$ . Graphically, the region  $\hat{\psi}$  is found by plotting the  $LR_n(\eta)$ against  $\eta$ .

### 4.4.2 Objective three

Apart from examining the impact of financial development and sectoral growth on international trade, the aim of this objective is also to examine how financial development plays out in influencing international trade via sectoral value additions in Africa. Since the focus of this objective is on aggregating the African countries as a single unit, we use a panel data in examining the relationships among financial development, international trade and

sectoral value additions. This study departs from the use of traditional approaches such as the pooled OLS, fixed and random effects. For instance, Asteriou and Hall (2011) and Gujarati and Porter (2009) argue that the pooled OLS imposes homogenous intercept and slope parameters which obscure heterogeneity among countries, thus potentially allowing the error term to correlate with some regressors. On the other hand, the fixed effects pose significant bias (Baltagi, 2008) when some regressors are endogenous and correlated with the error terms (Campos & Kinoshita, 2008). The random effects models are time invariant implying that the error term at any period potentially exhibits strict exogeneity and does not correlate with the past, present and future series (Arellano, 2003). This stringent assumption is, however, less practicable in real life and does not distinguish between short and long run effects (Loayza & Ranciere, 2006). Given these problems, the study employs the Pesaran, Shin and Smith (1999) dynamic panel which addresses these challenges of the traditional approaches. Pesaran et al. (1999) suggest the use of mean group (MG) which averages the different country estimates while the pooled mean group (PMG) pools the long run parameters.

According to Pesaran et al. (1999), the PMG allows the intercept, the error variances and the short-run estimators to vary significantly while confining the equality of the long run coefficients among the countries. In other words, the PMG forces homogeneity in the long run parameters and at the same time allowing heterogeneity among the short run estimates. Thus, relative to the traditional approaches, the PMG has important advantages. First, apart from being independently distributed among the regressors, the error terms are not serially correlated. Second, the PMG produces consistent and efficient long-run estimates in the face of parameter homogeneity. Third, it maintains constant long run parameters across all the cross-sectional units. Fourth, unlike the dynamic panel generalized method of moments

(GMM) which is largely not suitable under long *T*, the PMG is particularly apt when dealing with dynamic heterogeneous panel involving large N = 46 and long T = 37.

With regard to the choice of the MG and PMG, this thesis relies on the PMG which unites the efficiency of the pooled estimation while avoiding inconsistency problem resulting from pooling heterogeneous dynamic nexuses. Apart from this, the long run estimates of the MG are consistent but inefficient particularly when homogeneity is eminent. Relative to the MG, the PMG also yields parameter estimates which are insensitive to data outliers.

To examine the impact of finance and sectoral value additions on international trade, the study sets up a model where international trade is a function of financial development and sectoral value addition as shown in equation (4.14):

$$TR_{it} = f(FD_{it}, SVA_{it}, \varepsilon_{it})$$
(4.14)

where  $TR_{it}$  is international trade indicators;  $FD_{it}$  is financial sector development indicators;  $SVA_{it}$  are sectoral value additions comprising agricultural, service and industrial sectors which we respectively denotes as  $AGR_{it}$ ,  $SER_{it}$  and  $IND_{it}$ ; *i* and *t* are country and time indices respectively while  $\varepsilon_{it}$  is the error term which measures the influence of other variables not captured in the international trade equation.

From equation (4.14), the study imposes the following Cobb-Douglas production function:

$$TR_{it} = f(FD_{it}^{\tau}, SVA_{it}^{\varphi}, \mu_{it}^{\varepsilon})$$
(4.15)

By explicitly writing equation (4.15) and introducing a constant, the study arrives at equation (4.16):

$$TR_{it} = FD_{it}^{\tau} + SVA_{it}^{\varphi} + \mu_{it}^{\varepsilon}$$
(4.16)

To linearize equation (4.16), we take the logarithm of the function and in so doing, the study derives equation (4.17):

$$InTR_{it} = \tau InFD_{it} + \varphi InSVA_{it} + \varepsilon_{it}In\mu_{it}$$
(4.17)

From equation (4.17),  $In\mu_{it} = 1$ . In addition to linearizing, taking the logarithm of the function reduces possible multicollinearity among the independent variables (Ibrahim and Musah, 2014). Following from this, our equation in (4.17) transforms into equation (4.18) as shown below:

$$InTR_{it} = \tau InFD_{it} + \varphi InSVA_{it} + \varepsilon_{it}$$
(4.18)

To the extent that the variables are expressed in logs, the coefficients in equation (4.17) can be interpreted as elasticities. Since the study imposes a Cobb-Douglas production function,  $\tau + \varphi = 1$ .

Since the study relies on three sectoral values additions, we further explicitly model equation (4.18) as:

$$InTR_{it} = \tau InFD_{it} + \varphi_1 InAGR_{it} + \varphi_2 InSER_{it} + \varphi_3 InIND_{it} + \varepsilon_{it}$$
(4.19)

From equation (4.19),  $\tau + (\varphi_1 + \varphi_2 + \varphi_3) = 1$  where  $\tau$  measures the contribution of financial sector development to international trade,  $\varphi_1$ ,  $\varphi_2$  and  $\varphi_3$  respectively measures the contributions of agric, service and industrial sector value additions to international trade. Following from Pesaran et al. (1999), the study introduces the fixed effects estimator in order to estimate the pool mean group (PMG) as shown in equation (4.20) below:

$$InTR_{it} = \partial_i + \tau InFD_{it} + \varphi_1 InAGR_{it} + \varphi_2 InSER_{it} + \varphi_3 InIND_{it} + \varepsilon_{it}$$
(4.20)

i = 1, 2, ..., N = 46; t = 1, 2, ..., T = 37; where  $\partial_i$  is the fixed effect.
To examine the transmission channels of finance–trade nexus, the researcher introduces an interactive term of  $FD_{it}$  and  $SVA_{it}$  into the trade equation in (4.20).<sup>4</sup> Specifically, the researcher formulates the following equation where the indirect effect of finance is measured by  $\psi$ :

$$InTR_{it} = \partial_i + \xi InFD_{it} + \gamma_1 InAGR_{it} + \gamma_2 InSER_{it} + \gamma_3 InIND_{it} + \psi (InFD_{it} \times InSVA_{it}) + \varepsilon_{it}$$

$$(4.21)$$

where *SVA* represents the indicators of all the sectoral value additions while  $\xi$ ,  $\gamma_1$ ,  $\gamma_2$  and  $\gamma_3$  are the parameters for financial development, agric, service and industrial sectors respectively.

The study formulates equation (4.21) above in an autoregressive distributed lag (ARDL) framework to permit the dependent variable – international trade – to adjust to variations in finance and other changes in the independent variables. Specifically, this study estimates the PMG of the Pesaran et al. (1999) by fitting error correction model in an ARDL (p, q) technique specified in equation (4.22) as:

$$\Delta(InTR_{i})_{t} = \delta_{i} [(InTR_{i})_{t-1} - \{\theta_{0,i} + \theta_{1,i}(InQ_{i})_{t-1}\}] + \sum_{j=1}^{p-1} \alpha_{i,j} \Delta(InTR_{i})_{t-j} + \sum_{j=0}^{q-1} \gamma_{i,j} \Delta(InQ_{i})_{t-j} + \varepsilon_{i,t}$$
(4.22)  
$$i = 1, 2, \dots, N = 46; \qquad t = 1, 2, \dots, T = 37.$$

where *Q* represents the regressors including  $FD_{it}$ ,  $AGR_{it}$ ,  $SER_{it}$  and  $IND_{it}$  and the multiplicative interactive term of *FD* and *SVA*;  $\alpha$  and  $\gamma$  are the short run coefficients related

<sup>&</sup>lt;sup>4</sup> This approach has also been used by Giuliano & Ruiz-Arranz (2005), Khan et al., (2016); Hur et al., (2016); Kumi et al., (2017), Ibrahim & Alagidede (2017a) and Alagidede & Ibrahim (2017).

to international trade and its drivers;  $\theta_i$  are long run coefficients;  $\delta_i$  is the coefficient of the error correction term which measures the speed of adjustment to long run equilibrium while  $\varepsilon$  represents the time–varying disturbance.

Indeed, from the ARDL framework above, the PMG estimations, with the lag orders p and q suitably chosen, produces consistent estimates. Meanwhile, Loayza and Ranciere (2006) opine that, when the main interest is on the long-run estimates, the lag structure of the ARDL should be selected using appropriate information criteria on a country–by–country basis. Conversely, when there is also an attention in exploring the short run effects like in this study, it is suggested that a common lag structure be enforced for all countries. Thus, for easier exposition, in this study, we set both p and q at 1.

### 4.5 Conclusion

This chapter outlined the three estimation approaches in an attempt to achieve the three research objectives given their unique requirements. For the first objective, the study relied on the GMM estimation approach that controls for potential endogeneity eminent in the data while a sample splitting approach is fitted to examine the threshold effects of the second research objective. For the third objective, a PMG model is specified to examine the linkages in financial development, sectoral value additions and international trade.

### **CHAPTER FIVE**

## EMPIRICAL RESULTS: FINANCIAL DEVELOPMENT AND INTERNATIONAL TRADE NEXUS: DOES MEASURE OF FINANCIAL DEVELOPMENT MATTER?

#### 5.1 Introduction

This chapter presents the results of the first research objective. The first section presents findings based on the descriptive statistics of the variables as well as their associated correlations. The second section discusses the empirical findings and the robustness analysis while the third section presents some implication for policy. The last section concludes the chapter.

### 5.2 Descriptive Statistics

Table 5.1 shows the pooled results of variables over the sample period 1980–2015. For the proxies of financial development, domestic credit averages 32.98% which is higher relative to private credit of 20.37%. The study noticed that the mean trade openness and exports respectively measures 73% and 31.23% with standard deviations of 45.38 and 18.68. This evidence suggests that countries in Africa are comparatively opened to international market given the high value of trade openness. The value of inflation shows that the sampled countries are highly inflationary with Zimbabwe recording the highest inflation rate of 24,411%. There is also high inflation variability across the countries given the large standard deviation. Government size proxied by government expenditure averaged 15.43% with a maximum value of 84.51%. Average percentage of active population is about 54% while the mean gross fixed capital formation is 21.2%.

|              | DCRE     | PCRE    | EXP      | TRA      | GEXP   | INF       | GFCF   | POP    | RGDP      | ENRO   | SAV     |
|--------------|----------|---------|----------|----------|--------|-----------|--------|--------|-----------|--------|---------|
| Mean         | 32.98    | 20.37   | 31.23    | 73.00    | 15.43  | 59.69     | 21.20  | 53.65  | 1,886.43  | 33.80  | 11.96   |
| St. dev      | 62.54    | 21.62   | 18.68    | 45.38    | 6.72   | 896.90    | 15.52  | 4.62   | 2,580.29  | 23.46  | 21.15   |
| Min.         | 0.09     | 0.16    | 2.52     | 6.32     | 0.00   | -35.84    | -2.42  | 46.95  | 115.79    | 2.48   | -241.86 |
| Max.         | 266.18   | 160.12  | 124.39   | 531.74   | 84.51  | 24,411.03 | 219.07 | 70.78  | 20,333.94 | 108.27 | 83.29   |
| Skewness     | 22.32    | 2.97    | 1.24     | 3.63     | 2.27   | 25.71     | 15.52  | 1.59   | 3.04      | 0.91   | 2.78    |
| Kurtosis     | 715.64   | 14.53   | 5.16     | 26.41    | 16.73  | 685.96    | 58.61  | 5.32   | 14.37     | 3.07   | 27.93   |
| Observations | 1,565    | 1,561   | 1,575    | 1,575    | 1,517  | 1,508     | 1,507  | 1,702  | 1,656     | 1,068  | 1,511   |
| Correlations |          |         |          |          |        |           |        |        |           |        |         |
| PCRE         | 1.000    |         |          |          |        |           |        |        |           |        |         |
| DCRE         | 0.384    | 1.000   |          |          |        |           |        |        |           |        |         |
| EXP          | -0.057** | 0.095** | 1.000    |          |        |           |        |        |           |        |         |
| TRA          | 0.023*   | 0.064** | 0.804*** | 1.000    |        |           |        |        |           |        |         |
| GEXP         | 0.094    | 0.264   | 0.232    | 0.325    | 1.000  |           |        |        |           |        |         |
| INF          | -0.026   | -0.041  | 0.003    | -0.006** | -0.068 | 1.000     |        |        |           |        |         |
| GFCF         | 0.019    | 0.072   | 0.407    | 0.702*   | 0.161  | -0.045    | 1.000  |        |           |        |         |
| POP          | 0.204    | 0.573   | 0.328    | 0.213**  | 0.085  | -0.016    | 0.154  | 1.000  |           |        |         |
| RGDP         | 0.038*   | 0.344*  | 0.550*   | 0.280    | 0.090* | -0.027*   | 0.211  | 0.544  | 1.000     |        |         |
| ENRO         | 0.491    | 0.612*  | 0.387    | 0.259*   | 0.055  | -0.021    | 0.160  | 0.788* | 0.619     | 1.000  |         |
| SAV          | -0.122   | 0.109   | 0.310**  | -0.224*  | -0.181 | -0.015    | -0.070 | 0.233  | 0.518     | 0.374  | 1.000   |

 Table 5.1:
 Descriptive statistics and correlation coefficients

Note: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively. PCRE = Private credit (% of GDP); DCRE = Domestic credit (% of GDP); EXP = Exports (% of GDP); TRA = Trade openness (% of GDP); GEXP = Government expenditure (% of GDP); INF = Inflation (%); GFCF = Gross fixed capital formation (% of GDP); POP = Population (%); RGDP = Real GDP per capita (US\$); ENRO = Enrolment (% of gross) and SAV = Domestic savings (% of GDP); St. dev = Standard deviation; Min. = Minimum; Max. = Maximum

With regard to the proxy of economic growth, the average real GDP per capita is \$1,886.43 with a minimum and maximum income of \$115.79 and \$20,333.94 respectively. The wide disparity is reflected in a high standard deviation suggesting high variability across the countries. The rather low per capita income reflects the underdeveloped nature of the countries in the sample used. Enrolment as a measure of human capital is 33.8% while domestic savings averaged 11.96% of GDP with a standard deviation of 21.15%. Interestingly, all the variables are positively skewed to the right. The values of the kurtosis

and skewness show a non-normal distribution of all the series suggesting that the variables are leptokurtic.

With regard to the correlation coefficients, domestic credit is positively correlated with all the variables except inflation. The correlation is however significant with both measures of international trade, enrolment and real GDP per capita. Furthermore, private credit is also positively associated with all the series with the exception of exports, inflation and domestic savings. The study also noticed that, apart from private credit, export is positively correlated with all the variables and hugely correlated with trade openness. The strong and significant correlation with trade openness is expected since it forms part of trade openness given its computation as the sum of exports and imports to GDP. Figure 5.1 illustrates a plot of exports and private credit averaged over the period with one observation of finance, exports and trade openness for each country.



Figure 5.1: Private credit and international trade

While private credit is relatively homogenous for most of the countries, some outliers are palpable. For instance, Equatorial Guinea recorded the highest exports on the back of a lower financial development. On the other hand, South Africa and Liberia have higher level of financial development with relatively lower exports to GDP ratio. Similar pattern is also noticeable for private credit and trade openness. We replot finance–trade relationship using domestic credit in order to examine the distribution of countries' level of domestic credit and trade. From Figure 5.2, it is evident that there is an opposite distribution in South Africa and Equatorial Guinea. While South Africa has higher domestic credit and a relatively lower exports and trade openness, the reverse holds true for Equatorial Guinea.



Figure 5.2: Domestic credit and international trade

For the sample countries, majority of them are clustered at lower levels of domestic credit, exports and trade openness although the concentration is thicker with trade openness suggesting that bulk of the economies have homogeneous level of openness to international

trade. While Equatorial Guinea is the most opened economy, trade openness is lowest in Sudan with Burundi also recording the lowest exports share of GDP. Beyond the scatter plot of finance–trade relationship, the study presents the empirical results in the next section.

### 5.3 Empirical Results

The findings herein are presented in two forms. First, there is an examination of the impact of finance on trade proxied by exports where finance is measured by private and domestic credit. In the second section, the study re–estimates the finance effect of trade by using trade openness. For the first section, we regressed exports on its drivers while controlling for its lagged term as an additional explanatory variable. We extended the regressors to include the quadratic square term of the two proxies of financial development to check for nonlinearities as well as using the interactive term of private and domestic credit with economic growth to determine whether economic growth potentially mediate the relationship between financial development and international trade in Africa. Six regressions covering a period between 1980–2015 were run and the results are presented in Table 5.2.

| Table 5.2: Financial de    | velopment a                     | ina exports                    | nexus                          |                                 |                                 |                                |
|----------------------------|---------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|--------------------------------|
| Model                      | 1                               | 2                              | 3                              | 4                               | 5                               | 6                              |
| Constant                   | -6.513<br>[-2.77]<br>(0.006)    | -4.319<br>[-1.44]<br>(0.150)   | -3.395<br>[-1.42]<br>(0.156)   | -6.160<br>[-2.21]<br>(0.027)    | -6.767<br>[-2.91]<br>(0.004)    | -3.934<br>[-1.24]<br>(0.213)   |
| Lagged Exports             | 0.439***<br>[17.31]<br>(0.000)  | 0.401***<br>[12.86]<br>(0.000) | 0.478***<br>[20.48]<br>(0.000) | 0.399***<br>[10.62]<br>(0.000)  | 0.410***<br>[15.32]<br>(0.000)  | 0.414***<br>[10.94]<br>(0.000) |
| Private credit             | -0.038*<br>[-1.75]<br>(0.081)   | _                              | -0.144**<br>[-2.03]<br>(0.042) | _                               | 0.180<br>[0.179]<br>(0.377)     | _                              |
| Domestic credit            | _                               | 0.077***<br>[4.42]<br>(0.000)  | _                              | -0.080<br>[-0.30]<br>(0.767)    | _                               | -0.263<br>[-0.56]<br>(0.574)   |
| Government expenditure     | 0.0127<br>[0.19]<br>(0.847)     | -0.011<br>[-0.54]<br>(0.592)   | 0.000<br>[0.00]<br>(0.998)     | 0.001<br>[0.03]<br>(0.974)      | -0.049<br>[-0.57]<br>(0.571)    | -0.023<br>[-0.92]<br>(0.359)   |
| Inflation                  | 0.013***<br>[2.69]<br>(0.007)   | 0.008<br>[1.60]<br>(0.109)     | 0.014***<br>[3.03]<br>(0.002)  | 0.010*<br>[1.77]<br>(0.076)     | 0.015***<br>[4.11]<br>(0.000)   | 0.012**<br>[2.15]<br>(0.032)   |
| Capital formation          | 0.086***<br>[4.03]<br>(0.000)   | 0.064***<br>[3.41]<br>(0.001)  | 0.093***<br>[4.98]<br>(0.000)  | 0.081***<br>[4.30]<br>(0.000)   | 0.103***<br>[6.17]<br>(0.000)   | 0.087***<br>[3.60]<br>(0.000)  |
| Population                 | 2.640***<br>[3.73]<br>(0.000)   | 1.883*<br>[1.91]<br>(0.056)    | 1.832**<br>[2.33]<br>(0.020)   | 2.561***<br>[3.44]<br>(0.001)   | 2.679***<br>[3.97]<br>(0.000)   | 2.154***<br>[3.41]<br>(0.001)  |
| Real GDP per capita        | -0.363***<br>[-3.36]<br>(0.001) | -0.198<br>[-0.82]<br>(0.415)   | -0.350**<br>[-2.11]<br>(0.035) | -0.306***<br>[-3.12]<br>(0.002) | -0.349***<br>[-2.94]<br>(0.003) | -0.433<br>[-1.62]<br>(0.106)   |
| Enrolment                  | 0.010<br>[0.11]<br>(0.910)      | -0.111<br>[-1.26]<br>(0.207)   | 0.005<br>[0.07]<br>(0.948)     | -0.098<br>[-1.36]<br>(0.175)    | 0.068<br>[0.82]<br>(0.410)      | -0.063<br>[-0.91]<br>(0.362)   |
| Domestic savings           | 0.077***<br>[8.18]<br>(0.000)   | 0.086***<br>[8.65]<br>(0.000)  | 0.076***<br>[7.56]<br>(0.000)  | 0.079***<br>[6.26]<br>(0.000)   | 0.067***<br>[6.92]<br>(0.000)   | 0.085***<br>[8.20]<br>(0.000)  |
| Private credit squared     | _                               | _                              | 0.025**<br>[2.12]<br>(0.034)   | _                               | _                               | _                              |
| Domestic credit squared    | _                               | _                              | _                              | 0.026<br>[0.56]<br>(0.572)      | _                               | _                              |
| CHANNELS                   |                                 |                                |                                |                                 |                                 |                                |
| Private credit x Real GDP  | _                               | _                              | _                              | _                               | -0.030<br>[-1.05]<br>(0.295)    | _                              |
| Domestic credit x Real GDP | _                               | _                              | _                              | _                               | _                               | 0.044<br>[0.70]<br>(0.486)     |
| Threshold                  |                                 |                                | 288%                           |                                 |                                 |                                |

### Table 5.2: Financial development and exports nexus

|                         | 1        | 2        | 3        | 4        | 5        | 6       |
|-------------------------|----------|----------|----------|----------|----------|---------|
| DIAGNOSTICS             |          |          |          |          |          |         |
| Wald $\chi^2$           | 3,972.47 | 2,322.98 | 5,102.42 | 1,159.20 | 2,037.90 | 1085.89 |
| <i>p</i> –values        | (0.000)  | (0.000)  | (0.000)  | (0.000)  | (0.000)  | (0.000) |
| Sagan test ( $\chi^2$ ) | 34.834   | 33.673   | 33.946   | 32.270   | 36.206   | 31.973  |
| <i>p</i> -values        | (1.000)  | (1.000)  | (1.0000) | (1.000)  | (1.000)  | (1.000) |
| AR(1)                   | -1.566   | -1.461   | -1.412   | -1.390   | -1.301   | -1.230  |
| <i>p</i> -values        | (0.000)  | (0.000)  | (0.000)  | (0.000)  | (0.000)  | (0.000) |
| AR(2)                   | -1.218   | -1.192   | -1.133   | -1.100   | -1.077   | -1.033  |
| <i>p</i> -values        | (0.178)  | (0.161)  | (0.143)  | (0.137)  | (0.121)  | (0.111) |
| Observations            | 493      | 521      | 493      | 521      | 493      | 521     |

 Table 5.2:
 Financial development and exports nexus (continued)

Note: \*\*\*, \*\* and \* represent the level of significance at 1%, 5% and 10% respectively. Values in [] and () are the z-test statistics and p-values respectively.

From the results above in model 1, it is evident that there is a negative relationship between private credit and exports although the effect is slightly at 10%. This implies that using private credit as a measure of financial development dampens exports. Therefore, attempt to boost trade via private credit does not enhance exports growth since a unit–percentage increase in private credit reduces exports by 0.038%. Aside private credit, government expenditure and enrolment have positive effects on trade. However, none of these effects are significant at conventional levels in all the exports equations. There is evidence that government spending enhances the expansion of domestic output and income, resulting in higher demand for increasing imports. The increased imports potentially culminate in higher income abroad which may trigger demand for domestic exports. However, the evidence in this study contrasts this logic given the varying and insignificant effect of government expenditure on exports.

Inflation, gross fixed capital formation, population and gross domestic saving have positive effect on trade and highly significant at 1% level. In expansionary economies, inflation will likely rise and subsequently lead to production of goods resulting in increase in the volume of exports. Therefore, it is not surprising that higher inflation in this case enhances trade. In the case of capital formation, it is positive and significant at 1% as expected because higher

investment in fixed capital accumulation and investment promotes productivity in goods and services hence raising exports.

Interestingly, relative to economies with lower proportion of active labour in total population, countries with large proportion of active labour are able to increase aggregate production given that labour comprise a key input in the aggregate production function. As domestic production increases, overall export is expected to improve. Therefore, the positive relationship between labour availability and trade does not come as a surprise. Thus, countries with high productive labour relative to their populations would potentially improve their exports levels since they can afford to produce at cheaper and competitive prices.

On the other hand, real GDP per capita has significantly negative effect on trade implying that as the economy grows, trade is dampened. There could be several factors that account for this inverse relationship. As the economy grows, local consumption of goods and services might also increase because many consumers within the economy will be employed and incomes enhanced and consequently lead to big ticket spending for locally manufactured goods and services which will reduce the amount of exports in the economy. Indeed, fast growing economies are more likely to experience lower exports and this is not different in the findings.

With regard to savings-exports nexus, the impact of savings on exports is positive and robust with coefficient ranging between 0.067 to 0.086. Thus, higher domestic savings spurs exports. More domestic savings translates into cheaper credit availability to industry and private sector which is ultimately allocated to investors in the financial intermediation functions played by the financial sector. Once saving makes cheap credit available, the

65

private sector borrows and expands their domestic production fostering exports. In the case of Africa, this effect is economically large.

In column 2, we proxy financial development by domestic credit. The findings here, however, contradict the first instance and rather heighten trade. This means that if the financial system is developed or enhanced, exports will be heightened hence trade. In this case, it is evident that the direction of financial development on trade is determined by the proxy used given the differential effects of the two measures. In this study, it is evident that domestic credit is positive with trade and significant at 1% level. It implies a unit–percentage increase in domestic credit leads to 0.077% increases in trade. Baltagi et al. (2009) explain that domestic credit captures the government and central bank transactions and therefore, is more likely to positively affect trade in under-developed economies since their financial sectors are largely driven by governments. Given that African countries faced that situation, it is not surprising that the results support the argument. Economies that want to boost exports will have to pay attention on developing the domestic credit sector because it will yield better dividend compared to the other measures of finance.

In column 3, we set out to examine whether there is a specific threshold beyond which countries the effect of finance on trade may change sign when finance is proxied by private credit. In doing so, we included a quadratic square term of finance in the equation in order to examine possible nonlinearities in finance–trade nexus. We find that the coefficients of the level effect of private credit and the square term are –0.144 and 0.025, respectively. This suggests a non–monotonic relationship between private credit and exports. Against the backdrop of a significantly negative coefficient of the level effect and a significantly positive coefficient on the square term, the study concludes that the nexus between private credit and

exports is U–shaped. Thus, finance does not promote exports except when it exceeds a certain threshold. Given this relationship, the researcher is able to estimate a threshold where further financial deepening is associated with increasing exports share of GDP.

In this estimation, we determine the nature and exact threshold value by taking the first derivative of trade in the equation with respect to financial development and setting the result to zero. The estimated threshold is 288%.<sup>5</sup> The implication is that, for countries to benefit from financial sector development, their level of private credit to GDP ratio should be maintained above the threshold. The countries with private credit ratio to GDP in this study close to the minimum threshold are 156.23% and 138.03% for Liberia and South Africa respectively. The threshold evidence is however not in sync with Gächter and Gkrintzalis (2017), who found an inverted U–shaped relationship with a threshold effect of domestic credit on exports given the insignificance impact of the quadratic term.

It is evident that countries in Africa are unable to benefit from trade enhancement resulting from domestic financial development. As a result of the rather underdeveloped financial markets in member countries, it will be prudent that they consider improving the two main measures of finance to get the minimum thresholds recorded in this study if they are to realize the full impact of finance on trade. Inflation, gross fixed capital formation, population and savings are all positive and robustly related with trade except real GDP per capita which is negative.

<sup>&</sup>lt;sup>5</sup> By setting the partial derivative to zero, from equation (2), the threshold is calculated as:  $\frac{\partial t_{it}}{\partial FD_{it}} = \alpha_1 + 2\rho FD_{it} = 0 \Rightarrow FD_{it} = \frac{-\alpha_1}{2\rho} \Rightarrow \frac{-(-0.144)}{2(0.025)} = 288\%$ . This corresponds to the threshold as reported in Table 5.2.

In column 5, we examine whether financial development proxied by private credit has significant impact on trade via economic growth. Government expenditure, economic growth as control variables are negative but GDP per capita is significant at 1% level. This confirms the explanation given earlier that when the economy grows, incomes are enhanced which may increase the purchasing power of consumers in the economy that could increase the consumption of locally manufactured goods and services leaving lesser quantities for exports. The rest of the control variables are positive and significant.

In the analysis, it is evident that the type of proxy used to measure finance is very important in understanding the impact of finance on trade. In this vein, it can be said that when the economy expands, the private sector will produce more and measures to improve balance of trade could also be adopted. This could also lead to increase in trade with other countries, hence boosting international trade. Government expenditure, real GDP per capita as control variables are negative. However, only the impact of economic growth is significant. Inflation, gross fixed capital formation, population and saving have shown to have robustly positive effect on trade.

In the next section, we regress trade openness on its initial values and other controls in addition to the indicators of financial development, its square and multiplicative interactive terms measuring transmission channels through which finance affects trade. This study includes time and country effect dummies to eliminate time–related shocks and country–level heterogeneity in trade trajectory. We estimate six models by sequentially introducing the set of explanatory variables while altering the measure of finance to determine the robustness of the regressors to model specification. Table 6.3 presents findings on the relationship among financial development, trade, economic growth and other controls relying on a panel dataset spanning 1980–2015.

| Table 5.5. Financial developin        | iciii–ii auc                   | openness                       | пслиб                          |                               |                                |                                |
|---------------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|
|                                       | 1                              | 2                              | 3                              | 4                             | 5                              | 6                              |
| Constant                              | 0.282<br>[0.11]<br>(0.914)     | -2.908<br>[-1.45]<br>(0.148)   | -0.125<br>[-0.05]<br>(0.958)   | -3.673<br>[-1.78]<br>(0.076)  | 0.563<br>[0.19]<br>(0.852)     | -4.683<br>[-2.26]<br>(0.024)   |
| Lagged trade<br>Openness              | 0.428***<br>[11.51]<br>(0.000) | 0.418***<br>[7.39]<br>(0.000)  | 0.444***<br>[11.75]<br>(0.000) | 0.406***<br>[6.73]<br>(0.000) | 0.450***<br>[11.03]<br>(0.000) | 0.396***<br>[6.62]<br>(0.000)  |
| Private credit                        | 0.013<br>[0.68]<br>(0.499)     | _                              | -0.069**<br>[-2.27]<br>(0.023) | _                             | 0.159<br>[0.55]<br>(0.581)     | _                              |
| Domestic credit                       | _                              | 0.061***<br>[4.04]<br>(0.000)  | _                              | -0.033<br>[-0.19]<br>(0.852)  | _                              | 0.157<br>[1.43]<br>(0.152)     |
| Government expenditure                | -0.133<br>[-1.50]<br>(0.133)   | -0.153**<br>[-2.44]<br>(0.015) | -0.127<br>[-1.49]<br>(0.137)   | -0.109<br>[-1.43]<br>(0.154)  | -0.146*<br>[-1.84]<br>(0.066)  | -0.123*<br>[-1.87]<br>(0.062)  |
| Inflation                             | 0.013***<br>[3.57]<br>(0.000)  | 0.019***<br>[6.56]<br>(0.000)  | 0.015***<br>[4.55]<br>(0.000)  | 0.020***<br>[7.04]<br>(0.000) | 0.012**<br>[2.38]<br>(0.018)   | 0.020***<br>[6.50]<br>(0.000)  |
| Capital formation                     | 0.261***<br>[18.93]<br>(0.000) | 0.258***<br>[10.42]<br>(0.000) | 0.263***<br>[5.37]<br>(0.000)  | 0.252***<br>[9.82]<br>(0.000) | 0.268***<br>[5.66]<br>(0.000)  | 0.251***<br>[10.50]<br>(0.000) |
| Population                            | 0.348<br>[0.40]<br>(0.691)     | 1.644***<br>[2.72]<br>(0.007)  | 0.677<br>[0.84]<br>(0.403)     | 1.897***<br>[3.04]<br>(0.002) | 0.128<br>[0.13]<br>(0.894)     | 2.098***<br>[3.15]<br>(0.002)  |
| Real GDP per capita                   | 0.064<br>[0.37]<br>(0.715)     | -0.219<br>[-1.51]<br>(0.131)   | -0.075<br>[-0.44]<br>(0.659)   | -0.246*<br>[-1.79]<br>(0.074) | 0.141<br>[0.81]<br>(0.415)     | -0.212<br>[-1.23]<br>(0.219)   |
| Enrolment                             | -0.068<br>[-1.29]<br>(0.195)   | -0.078<br>[-1.30]<br>(0.192)   | -0.047<br>[-0.94]<br>(0.350)   | -0.074<br>[-1.29]<br>(0.195)  | -0.071*<br>[-1.67]<br>(0.095)  | -0.093<br>[-1.64]<br>(0.101)   |
| Domestic savings                      | -0.005<br>[-0.57]<br>(0.570)   | 0.004<br>[0.51]<br>(0.608)     | -0.002<br>[-0.23]<br>(0.817)   | 0.005<br>[0.71]<br>(0.480)    | -0.007<br>[-0.86]<br>(0.388)   | 0.004<br>[0.49]<br>(0.627)     |
| Private credit squared                | _                              | _                              | 0.015***<br>[3.35]<br>(0.001)  | _                             | _                              | _                              |
| Domestic credit squared               | _                              | _                              | _                              | 0.016<br>[0.53]<br>(0.598)    | _                              | _                              |
| CHANNELS                              |                                |                                |                                |                               |                                |                                |
| Private credit x Real GDP             | _                              | _                              | _                              | _                             | -0.021<br>[-0.50]<br>(0.617)   | _                              |
| Domestic credit x Real GDP per capita | _                              | _                              | _                              | _                             | _                              | -0.013<br>[-0.85]<br>(0.395)   |
| Threshold                             |                                |                                | 230%                           |                               |                                |                                |

### Table 5.3: Financial development-trade openness nexus

|                        | 1        | 2        | 3       | 4        | 5       | 6         |
|------------------------|----------|----------|---------|----------|---------|-----------|
| DIAGNOSTICS            |          |          |         |          |         |           |
| Wald $\chi^2$          | 2,832.26 | 2,583.29 | 561.210 | 2,721.16 | 473.010 | 5,372.120 |
| <i>p</i> -values       | (0.000)  | (0.000)  | (0.000) | (0.000)  | (0.000) | (0.000)   |
| Sargan test $(\chi^2)$ | 31.319   | 34.232   | 32.171  | 34.248   | 30.664  | 34.890    |
| <i>p</i> -values       | (1.000)  | (1.000)  | (1.000) | (1.000)  | (1.000) | (1.000)   |
| AR(1)                  | -1.876   | -1.775   | -1.611  | -1.501   | -1.490  | -1.412    |
| <i>p</i> -values       | (0.000)  | (0.000)  | (0.000) | (0.001)  | (0.000) | (0.001)   |
| AR(2)                  | -1.411   | -1.432   | -1.401  | -1.350   | -1.366  | -1.280    |
| <i>p</i> -values       | (0.145)  | (0.161)  | (0.155) | (0.176)  | (0.118) | (0.131)   |
| Observations           | 493      | 521      | 493     | 521      | 493     | 521       |

 Table 5.3:
 Financial development-trade openness nexus (continued)

Note: \*\*\*, \*\* and \* represent the level of significance at 1%, 5% and 10% respectively. Values in [] and () are the z-test statistics and p-values respectively.

With regard to the effect of inflation, the finding suggests that inflation is positively and significantly related to trade. More specifically, a unit-percentage rise in inflation promotes trade with a coefficient ranging between 0.012 and 0.020. This finding is robust to model specification and sharply contrast Rousseau and Wachtel's (2002) study. The authors argue that inflation may inhibit trade since high inflation creates uncertainty about future prices, interest rates, and exchange rates, and this in turn increases the costs of hedging financial risks among potential trade partners. Moreover, if inflation increases the possibility of a devaluation and vulnerability to speculative attacks, hedging instruments will become even more expensive and difficult to price. As a result, high inflation can be detrimental to international trade. However, there is no evidence for the deleterious effect of inflation on trade. Perhaps the rather underdeveloped financial markets, on the back of market friction and fragmentation, make hedging in Africa difficult to exact such a negative relationship between inflation and trade. Apart from this, higher domestic inflation perhaps makes foreign goods cheaper to domestic agents, thus spurring international trade.

The impact of gross fixed capital formation is also positive and statistically significant at 1%. Specifically, in column 1, a 1% rise in capital formation enhances trade by 0.261%. Thus, capital deepening is healthy for trade. This finding is consistent with Gächter and Gkrintzalis

(2017). Population, real GDP per capita, enrolment and domestic savings do not significantly affect trade based on the model estimations.

In column 2, we proxy financial development by the level of domestic credit as a regressor while maintaining the covariates in column 1. Here, we find that, relative to private credit, domestic credit as a measure of financial sector development positively and significantly influences trade. Specifically, a unit-percentage rise in finance increases trade by 0.061%. Thus, the view that financial development accelerates trade openness by acting as an insurance mechanism and a source of countries' comparative advantage holds with data. Practically, if greater international trade increases exposure to the vagaries of the world goods market, then the development of domestic financial system as an insurance mechanism might limit barriers to trade. And as opined by Feeney and Hillman (2004), the development of financial markets that mitigates informational asymmetries could lead to more trade liberalization and trade flows. This empirical finding is therefore consistent with Kim et al., (2010b).

Column 1 reports the drivers of trade in addition to the unique effect of financial development on trade proxied by trade openness. Lagged trade is included as an explanatory variable to examine the convergence of trade in Africa. We find that the coefficient of the initial trade variable is positive and statistically significant suggesting a conditional divergence. The implication is that, for each country in the sample, their volume of trade diverges and do not show signs of convergence to their own steady state level of trade. This is valid irrespective of the model specification. Thus, countries with higher initial trade flows experience more rapid international trade.

In this estimation, the impact of government expenditure on trade turns significant with a coefficient of -0.153% suggesting that government size does not enhance overall trade. The compensation hypothesis argues that an economy's openness is positively associated with the level of government expenditure due to its higher risks because governments could afford social insurance against external risks (Rodrik, 1997, 1998). Thus, more open economies are exposed to a greater risk, as a result of the possible turbulences in the international markets, which can affect their domestic economy. To the extent that the public sector is considered a safe haven (both in terms of income and employment creation) in the domestic economy, higher government spending increases trade openness. In the case of Africa, our findings do not appear to support the compensation hypothesis perhaps due to high unemployment rate and low income which makes fiscal policy an ineffective tool in fostering international market integration.

The impact of inflation is robustly positive and significant while gross fixed capital formation is positive albeit a reduced coefficient. Interestingly, population gains significance when the regression is estimated with domestic credit as a measure of finance. A more than proportionate increase in trade following increases in the percentage of active labour force is noticed. Real GDP per capita–trade nexus turns negative although the impact is still insignificant. This evidence suggests that economic growth does not enhance trade volumes and so are human capital and domestic savings. Intuitively, development of country's human capital is expected to enhance their trade at the international market. However, this is not supported by this study and to the extent that region's human capital is comparatively low relative to the advanced economies may well account for the insignificance of human capital– trade nexus.

In column 3, we include a quadratic term of private credit to examine potential threshold effect of finance. In this estimation, financial development proxied by private credit is negative and statistically significant where a 1 percent increase in finance decreases trade by 1.04% suggesting that financial development inhibits international trade. It is evident that the coefficient of the quadratic term is positive and statistically significant at 1% while the coefficient of the level effect is negative and statistically significant. The differencing sign of the level effect of private credit and its square term shows a non–linear relationship between private credit and trade openness. Specifically, the U–shaped nexus suggests that too much finance is healthy for trade.

Given the threshold effect, what is the optimal level of private credit consistent with long run trade flows? We determine the threshold value by taking the partial derivative of the trade equation with respect to private credit and setting the outcome to stationary. The finding suggests that finance enhances international trade when private credit to GDP ratio exceeds 230%.<sup>6</sup> However, none of the countries in the sample has an average private credit above the threshold, hence may not enjoy trade–enhancing effect of finance. Thus, financial sector development spurs trade in countries with well–developed financial system. In column 4 where finance is represented by domestic credit, we do not observe any significant effect of finance relative to the earlier finding. Including its square term does not improve its significance although the coefficient of the quadratic term is positive. Interestingly, real GDP per capita gains significance once it is controlled for the threshold effects of domestic credit.

Indeed, there are possible links between finance and international trade. In this study, we concentrate on the ability of domestic financial sector development to increase economic

<sup>&</sup>lt;sup>6</sup> By setting the partial derivative to zero, from equation (4.3), the threshold is calculated as:  $\frac{\partial TR_{it}}{\partial FD_{it}} = \alpha_1 + 2\rho FD_{it} = 0 \Rightarrow FD_{it} = \frac{-\alpha_1}{2\rho} \Rightarrow \frac{-(-0.069)}{2(0.015)} = 230\%$ . This corresponds to the threshold as reported in Table 5.3.

growth (represented by real per capita income) and domestic market size. The higher domestic income of agents is therefore expected to boost trade between and among nations. To the extent that higher financial development improves efficiency in financial intermediation spurs the efficiency with which economies trade externally.<sup>7</sup> Empirically, the application of the GMM proposed by Arellano and Bond (1991) and Arellano and Bover (1995) controls for possible reverse causality and simultaneity bias. While there is an ambiguous unconditional effect of finance on trade, in columns 5 and 6, we examine the conditional impact of finance on trade openness. Specifically, the researcher sought to determine whether domestic level of finance potentially influences trade through economic growth. This was done by including an interactive term of finance. This finding does not provide evidence of an indirect effect of finance on trade via growth irrespective of the indicator of finance. More importantly, the coefficients of the interactive terms are both negative and insignificant.

With regard to the adequacy of the models used, the p-values of the Wald chi square statistic show that all the models are jointly and highly significant at 1%. The tests for overidentifying restriction strongly support the validity of the instruments given the failure to reject the null hypotheses for the Sargan's tests. There is also an absence of first-order serial correlation. However, the high (low) p-values (z-values) show the existence of second order correlation, given the failure to reject null hypothesis of second order correlation. These diagnostic tests provide credence to the findings and validity of the instruments used.

<sup>&</sup>lt;sup>7</sup> Indeed, to the extent that a country's financial development is endogenous, it will in turn be influenced by trade thus causing potential endogeneity (see Do & Levchenko, 2014).

### 5.3.1 Robustness analysis

In this section, the study conducts some robustness analysis by sequentially altering the regressors, the measure of finance and trade. Specifically, for the export regression results in Table 5.2, it is evident that government expenditure and enrolment were largely insignificant irrespective of the model specification. The quadratic and interactive terms do not also appear significant in the previous findings. On this score, we dropped these variables to examine the robustness of the variables and present the findings on this in panel A of Table 5.4. Similarly, for the trade openness regression, savings and enrolment were largely insignificant hence their exclusion for the sensitivity analysis as shown in panel B of Table 5.4.

|                   |           |          | PAN      | NEL A     | -         |               |           | PANEL B   |           |           |           |           |  |
|-------------------|-----------|----------|----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|-----------|-----------|--|
| _                 |           |          | Ex       | ports     |           |               |           |           | Trade Op  | penness   |           |           |  |
|                   | 1         | 2        | 3        | 4         | 5         | 6             | 7         | 8         | 9         | 10        | 11        | 12        |  |
|                   | -6.096    | -0.980   | -0.438   | -5.526    | -0.120    | -0.108        | -1.997    | -5.192    | -1.930    | -2.220    | -4.464    | -2.080    |  |
| Constant          | [-4.92]   | [-0.95]  | [-0.42]  | [-4.39]   | [-0.12]   | [-0.11]       | [-2.35]   | [-4.71]   | [-2.13]   | [-2.67]   | [-4.12]   | [-2.33]   |  |
|                   | (0.000)   | (0.341)  | (0.673)  | (0.000)   | (0.902)   | (0.911)       | (0.019)   | (0.000)   | (0.033)   | (0.008)   | (0.000)   | (0.020)   |  |
|                   | 0.447***  | 0.631*** | 0.634*** | 0.450***  | 0.620***  | 0.616***      | 0.630***  | 0.449***  | 0.613***  | 0.607***  | 0.444***  | 0.622***  |  |
| Lagged Trade      | (11.73)   | [21.82]  | [22.14]  | [12.10]   | [21.93]   | [21.88]       | [22.78]   | [13.63]   | [23.35]   | [22.45]   | [13.72]   | [24.77]   |  |
|                   | (0.000)   | (0.000)  | (0.000)  | (0.000)   | (0.000)   | (0.000)       | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   |  |
|                   | -0.034*   | -0.017   | -0.010   |           |           |               | -0.036*** | -0.027*   | -0.027**  |           |           |           |  |
| Private credit    | [-1.78]   | [-1.11]  | [-0.68]  | _         | _         | _             | [-2.95]   | [-1.84]   | [-2.58]   | _         | _         | _         |  |
|                   | (0.075)   | (0.266)  | (0.494)  |           |           |               | (0.003)   | (0.065)   | (0.010)   |           |           |           |  |
|                   |           |          |          | 0.041*    | 0.060***  | $0.058^{***}$ |           |           |           | 0.044***  | 0.044**   | 0.004     |  |
| Domestic credit   | —         | —        | _        | [1.76]    | [3.06]    | [3.18]        | —         | _         | _         | [2.67]    | [2.30]    | [0.24]    |  |
|                   |           |          |          | (0.078)   | (0.002)   | (0.001)       |           |           |           | (0.008)   | (0.022)   | (0.807)   |  |
|                   |           | 0.064**  |          |           | 0.003     |               | 0.077***  | 0.039     | 0.086***  | 0.032     | -0.015    | 0.060**   |  |
| Gov. expenditure  |           | [1.98]   | _        | —         | [0.10]    |               | [2.89]    | [1.21]    | [3.58]    | [1.31]    | [-0.48]   | [2.52]    |  |
|                   | —         | (0.048)  |          |           | (0.917)   | —             | (0.004)   | (0.228)   | (0.000)   | (0.190)   | (0.630)   | (0.012)   |  |
|                   | 0.017**   | 0.013*   | 0.011*   | 0.015*    | 0.014**   | 0.015**       | 0.013**   | 0.023***  | 0.014***  | 0.012**   | 0.022***  | 0.012**   |  |
| Inflation         | [2.13]    | [1.91]   | [1.73]   | [1.81]    | [2.18]    | [2.27]        | [2.40]    | [3.65]    | [2.54]    | [2.23]    | [3.45]    | [2.23]    |  |
|                   | (0.033)   | (0.056)  | (0.084)  | (0.070)   | (0.029)   | (0.023)       | (0.016)   | (0.000)   | (0.011)   | (0.026)   | (0.001)   | (0.026)   |  |
|                   | 0.101***  | 0.038    | 0.043    | 0.066**   | 0.015     | 0.018         | 0.196***  | 0.237***  | 0.147***  | 0.163***  | 0.219***  | 0.139***  |  |
| Capital formation | [3.20]    | [1.30]   | [1.49]   | [2.15]    | [0.56]    | [0.72]        | [8.39]    | [10.46]   | [8.06]    | [7.27]    | [9.79]    | [7.84]    |  |
|                   | (0.001)   | (0.192)  | (0.135)  | (0.031)   | (0.573)   | (0.469)       | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   |  |
|                   | 2.531***  | 0.691**  | 0.575*   | 2.466***  | 0.693**   | 0.692**       | 1.046***  | 2.100***  | 0.894***  | 1.267***  | 2.148***  | 0.957***  |  |
| Population        | [6.71]    | [2.30]   | [1.90]   | [6.41]    | [2.46]    | [2.45]        | [4.27]    | [6.84]    | [3.59]    | [5.32]    | [6.72]    | [3.88]    |  |
|                   | (0.000)   | (0.021)  | (0.058)  | (0.000)   | (0.014)   | (0.014)       | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   | (0.000)   |  |
| Deal CDD per      | -0.370*** | -0.140** | -0.133** | -0.402*** | -0.255*** | -0.254***     | -0.192*** | -0.314*** | -0.090*** | -0.274*** | -0.364*** | -0.108*** |  |
| conito            | [-4.28]   | [-2.36]  | [-2.25]  | [-4.50]   | [-4.44]   | [-4.46]       | [-4.24]   | [-4.65]   | [-2.83]   | [-6.27]   | [-5.07]   | [-3.80]   |  |
| Capita            | (0.000)   | (0.018)  | (0.025)  | (0.000)   | (0.000)   | (0.000)       | (0.000)   | (0.000)   | (0.005)   | (0.000)   | (0.000)   | (0.000)   |  |
|                   | 0.019     |          |          | -0.041    |           |               |           | 0.037     |           |           | -0.002    |           |  |
| Enrolment         | [0.34]    | _        | _        | [-0.77]   | _         | _             |           | [0.93]    | _         | _         | [-0.06]   |           |  |
|                   | (0.737)   |          |          | (0.444)   |           |               | _         | (0.351)   |           |           | (0.954)   | —         |  |
|                   | 0.067***  | 0.074*** | 0.073*** | 0.075***  | 0.086***  | 0.086***      | 0.012**   |           |           | 0.021**   |           |           |  |
| Domestic savings  | [5.19]    | [6.97]   | [6.89]   | [5.075]   | [8.23]    | [8.26]        | [-2.35]   | _         | _         | [2.41]    | _         | _         |  |
|                   | (0.000)   | (0.000)  | (0.000)  | (0.000)   | (0.000)   | (0.000)       | (0.019)   |           |           | (0.016)   |           |           |  |

### Table 5.4: Financial development, exports and trade openness nexuses

|                        |         | 1       | / 1     | 1       |         | <b>`</b> | <u> </u> |         |         |         |         |         |  |
|------------------------|---------|---------|---------|---------|---------|----------|----------|---------|---------|---------|---------|---------|--|
|                        |         |         | PAN     | NEL A   |         |          | PANEL B  |         |         |         |         |         |  |
|                        |         |         | Ex      | ports   |         |          | Trade Op | penness |         |         |         |         |  |
|                        | 1       | 2       | 3       | 4       | 5       | 6        | 7        | 8       | 9       | 10      | 11      | 12      |  |
| DIAGNOSTICS            |         |         |         |         |         |          |          |         |         |         |         |         |  |
| Wald $\chi^2$          | 326.96  | 678.00  | 658.52  | 297.25  | 690.92  | 684.17   | 913.660  | 581.820 | 849.68  | 909.440 | 576.31  | 971.320 |  |
| <i>p</i> -values       | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000)  | (0.000)  | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |  |
| Sargan test $(\chi^2)$ | 469.715 | 710.469 | 719.494 | 487.832 | 716.159 | 723.840  | 692.100  | 553.326 | 805.316 | 701.087 | 577.666 | 794.922 |  |
| <i>p</i> -values       | (0.002) | (0.000) | (0.000) | (0.003) | (0.000) | (0.000)  | (0.002)  | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) |  |
| AR(1)                  | -1.598  | -1.588  | -1.473  | -1.469  | -1.442  | -1.388   | -1.681   | -1.601  | -1.581  | -1.500  | -1.490  | -1.444  |  |
| <i>p</i> -values       | (0.000) | (0.000) | 0(.000) | (0.001) | (0.000) | (0.000)  | (0.000)  | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) |  |
| AR(2)                  | -1.102  | -1.245  | -1.201  | -1.182  | -1.081  | -1.100   | -1.200   | -1.221  | -1.192  | -1.130  | -1.011  | -1.095  |  |
| <i>p</i> -values       | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000)  | (0.000)  | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) |  |
| Observations           | 494     | 835     | 838     | 523     | 896     | 900      | 835      | 559     | 989     | 896     | 590     | 1,053   |  |

### Table 5.4: Financial development, exports and trade openness nexuses (continued)

Note: \*\*\*, \*\* and \* represent the level of significance at 1%, 5% and 10% respectively. Values in [] and () are the *z*-test statistics and *p*-values respectively.

The divergence of trade trajectory is robust in this study given the negative lagged trade coefficients. Beginning with private credit in columns 1 to 3, it is obvious that the impact of finance is negative, suggesting that private credit does not propel trade. However, this effect is slightly significant at 10% in column 1 and insignificant in columns 2 and 3. Interestingly, domestic credit is positive and significant at conventional levels for all the regressions. The data reveals that much effect is registered when only government expenditure is controlled for with effect measuring at least 1.46 times larger than when only enrolment is included. Thus, higher domestic credit leads to greater exports and integration into the international market economy. This finding is consistent with Beck (2002) whose aggregate cross–country data shows that financial development positively affects exports in manufactured goods.

Turning to openness to trade, there is a positive significant impact of domestic credit on trade openness in columns 10 and 11. This effect, however, loses significance when both enrolment and savings are excluded from the model in column 12. The evidence suggests that improvement in domestic credit exerts a positive effect on the level of trade openness because external financing potentials are generally indispensable to grow export capacities. This provides support to Kletzer and Bardhan's (1987) theoretical proposition that, relative to countries with underdeveloped financial sector, economies with well-developed domestic financial sectors enjoy easier access to external finance, hence specializes in industries that are more dependent on external finance thus increasing trade. On the other hand, the same cannot be argued for private credit. In panel B where trade is indicated by trade openness, there is evidence to show that consistent with the earlier finding in panel A, the impact of private credit is negative. However, in these estimations, the effect is significant irrespective of the model specification. Thus, given the indicators of finance, it is evident that the overall effect of financial development on international trade is conditioned on proxy where domestic

(private) credit magnifies (dampens) the level of trade. This conclusion holds based on the sample evidence from the data.

With regard to the controls, in panel A, inflation maintains its sign and significance in all the export regressions whether or not finance is proxied by private or domestic credit with export–enhancing effect ranging between 0.011% and 0.017%. This finding also holds irrespective of whether government expenditure or enrolment is controlled for. Similar finding is unearthed in panel B when international trade is proxied by trade openness with elasticity effects ranging between 0.012% and 0.023%. Thus, domestic inflationary pressure is good for exports. This finding is particularly inconsistent with Gächter and Gkrintzalis (2017) who find a negative and insignificant effect of inflation on exports. Consistent with Gächter and Gkrintzalis (2017), gross fixed capital formation is positively and significantly related to exports only when enrolment is included in the regression irrespective of the proxy of finance. However, the trade–enhancing effect here is huge with private credit measuring 1.53 times larger. In panel B, investment rate is positively and significantly related to trade openness at 1%. This particularly holds irrespective of the indicator of finance. Interestingly, investment rate elasticity effect of trade is larger with trade openness relative to exports suggesting gross fixed capital formation build–up largely spurs trade openness than exports.

In panel A, population is robust and positively related to exports with lowest impact registered when both government expenditure and enrolment are excluded. This finding also holds for trade openness irrespective of the model specification although it is inconsistent with Gächter and Gkrintzalis (2017) who found a negative impact of population. Arguably, large domestic market is expected to spur domestic demand while limiting countries' trade with the international market. However, the evidence from the data does not support this

assertion but rather suggests that, larger domestic market increases economies' trade engagement with the rest of the World. Hence, higher domestic markets measured by population do not inhibit trade. However, economic growth, proxied by real GDP per capita is negative and statistically significant at 1% in all the regressions. Relative to the earlier finding on growth-trade nexus, the impact of real GDP per capita is robust. Whether trade is measured by exports or level of openness, it is evident that, higher economic growth does not propel international trade with trade-inhibiting effect ranging between 0.133% and 0.402% for exports and 0.090% to 0.364% for openness. Alesina and Wacziarg (1998) opine that the cost of self-sufficiency is lower for large than small economies. Thus, countries with large (small) domestic markets should therefore be less (more) open to international trade. Consequently, GDP per capita is expected to increase international trade as the demand for variety in the choice of goods is likely to increase with wealth. On the supply-side, increases in income may lead to higher domestic production available for exports. However, the negative coefficients of real GDP per capita do not support these assertions. Perhaps, the GDP per capita levels of the countries are infinitesimally low to (i) permit higher demand for foreign variety of goods and (ii) increase exports through higher domestic production.

There is also evidence to suggest that the impact of domestic savings is robustly positive and highly significant for exports. Notice that, in the two trade openness regressions with savings, the effect of savings on openness is positive and significant at 5% albeit reduced effects relative to exports (columns 7 and 10). The significance of savings effect is at variance with the earlier finding in Table 6.3, suggesting that savings impact is only economically large in the absence of enrolment. However, enrolment–trade relationship is insignificant for all the trade measures and model specification confirming the earlier finding that, the region's human capital accumulation is potentially low to exert any significant effect on overall levels

of trade. Beyond enrolment-trade effect, it is evident that domestic level of savings is positively and significantly related to exports with equally huge impact consistent with the earlier finding in Table 5.2. Interestingly, for regressions controlling for savings (columns 7 and 10) in addition to other standard controls, there is a positive and significant effect of savings on trade openness. Specifically, a unit-percentage increase in savings increases openness by 0.012% and 0.021%. This effect contradicts the earlier evidence given significance of the level of effects suggesting that overall savings-trade openness link is not robust. A further examination of this shows that, although savings enhances international trade, this effect is economically and significantly stronger for exports.

#### 5.4 **Policy Implications and Recommendations**

This section highlights the key policy implications of the empirical findings emanating from the study to guide policy. Indeed, countries in Africa have moved to develop their financial sector in an attempt to improve their growth and trade flows through the implementation of various reforms. Undoubtedly, over the past few decades, extant studies have strongly established that well–developed financial system plays a significant role in influencing countries' level of international trade. Relying on data from 46 countries in Africa over the period 1980–2015, there is evidence to suggest an ambiguous effect of finance on trade. More specifically, finance–trade nexus is conditioned on the measure of finance, trade and covariates.

The evidence suggests that financial development when proxied by private credit does not enhance international trade while domestic credit appears to spur trade. This evidence holds irrespective of the indicator of trade but not the level of significance. However, this effect is robust once we alter the model by excluding consistently insignificant variables suggesting

that the impact of finance on trade depends on the measure of finance. Specifically, improving the level of private (domestic) credit harms (propels) exports and trade openness. However, does finance always harm or promote trade in Africa? The finding based on the non-linearity estimations reveals that only private credit-trade nexus is threshold specific and U-shaped in particular. More importantly, private credit only improves exports and trade openness when its level is at least 288% and 230% of GDP, respectively. The implication is that, countries in Africa will only benefit from private credit-enhancing trade effect when the average level of private credit is above their respective thresholds. However, none of the countries has an average private credit to GDP above the threshold, with Liberia recording the highest private credit of 156.23%. Therefore, the rather low levels of financial sector development of the countries do not appear to significantly spur trade as too much finance promotes both exports and trade openness. In other words, domestic financial markets may be detrimental to trade for countries with a very low level of financial development but has a positive effect on trade for economies with high level of financial system. Thus, a welldeveloped and well-functional financial market creates more international trade opportunity for economies concerned.

With only Liberia and South Africa approaching the relevant thresholds of financial development given their average financial depth, what is needed here is a good understanding of the optimal level of credit consistent with long run international trade. Thus, it is crucial for Central Banks in Africa to aggressively move private credit level towards an optimal level in a way that do not culminate in credit boom. Ibrahim and Alagidede (2016) present evidence that efforts in SSA to boost financial sector development led to episodes of credit boom in a number of countries. It is therefore imperative for the Central Banks to maintain a sound supervision of the financial markets with the aim of improving financial intermediation in supplying the right quality and quantity level of finance.

Theory and evidence suggest that, domestic financial sector development increases economic growth. Levine (1997; 2005) argues that financial development by far improves the production of *ex ante* information about possible investments, exact efficient corporate governance, diversification and risk management, efficiently mobilizes and pools savings as well as facilitate the exchange of goods and services. Thus, the growth–enhancing effect of financial development is based on its ability to mobilize productive savings and allocate resources efficiently. Higher economic growth also increases countries level of international trade by raising income levels of agents and expanding domestic markets triggered by higher aggregate demand. Hence, well–developed financial market is expected to indirectly spur international trade through economic growth. While there is somewhat unequivocal impact of finance on trade, the evidence does not support the indirect effect of finance and trade. In fact, in the case of Africa, even if finance has any influence on trade through growth, such effect is a dampening rather than an amplifying one. Thus, boosting cross–border trade relying on finance–growth nexus is only imaginary.

Beyond finance, government expenditure appears to insignificantly influence exports but significantly related to trade openness in most of the cases. Thus, fiscal policy as a tool to spur exports is subdued. Anecdotally, government spending is expected to boost domestic aggregate demand and productivity, all of which influences exports. However, this is not completely supported by the data. Perhaps, it is the quality of government spending that matter for enhancing exports. The higher inflationary pressure appears to significantly drive international trade. Theoretically, high inflation brews uncertainty about future prices, interest rates, and exchange rates thus exacerbating hedging cost among trading partners ultimately hampering external trade. This dynamic is however not supported by the sample

evidence. A possible elucidation is that the underdeveloped financial markets in Africa allow cheap hedging due to the underdeveloped nature of their financial markets thus making it possible for inflation effect to promote trade. Anecdotally, higher domestic prices make foreign goods cheaper to domestic participants thus increasing the overall level of international trade.

Indeed, bilateral trade flows between and among countries are taken to be proportional to their level of GDP. And as argued by Fujimura and Edmonds (2006), to the extent that higher GDP mirrors higher income, economies with higher income tend to be more inclined to product differentiation and specialization thereby fostering trade. This notwithstanding, the impact of real GDP per capita on trade openness and exports is unexpectedly negative. What has been observed in this study is that, higher levels of economic growth limit external trade. If consumers are taken to have identical preferences within and across countries and domestic aggregate demand is positively related to aggregate income, increases in GDP per capita is expected to reduce external trade while boosting internal demand. Thus, average level of real per capita income is not only crucial for intra–country trade but also matters for inter–country trade.

The strong impact of population on international trade also deserves some attention. There is evidence that countries with large population are potentially inwardly oriented relative to smaller economies because highly populated countries are more likely to take advantage of the economies of scale in their huge domestic market size (Frankel, 1997). Thus, trade flows may be negatively related to overall population size. The data, however, reveals that higher population size spurs international trade. Higher domestic markets proxied by population size foster trade openness in a way that allows foreign entry to take advantage of the increasing domestic markets in Africa and at the same time spurs overall exports.

#### 5.5 Conclusion

Undoubtedly, a well-developed and functional financial sector on the back of higher international trade can significantly improve countries' economic growth. However, existing empirical literature in international trade and finance have focused on examining the impact of either financial development or trade on long run growth. The few earlier studies on the impact of finance on trade have focused on developed economies or regional blocs with relatively well-developed financial system albeit inconclusive results. As a consequence, literature on finance-trade in Africa is scanty. Given the renewed interest in spurring the continent's international trade on the back of financial sector development merits rigorous empirical efforts in examining the precise impact of finance on international trade using recent data. This study examined the effect of financial development on trade in 46 African countries over the period 1980–2015 while controlling for potential simultaneity and endogeneity bias eminent in finance-trade relationship. It proxied proxy finance by private and domestic credit while our measures of trade include exports and trade openness all expressed as a percentage of GDP.

Results from the system generalized method of moments (GMM) show differential effects of finance on trade. In particular, there is evidence that, irrespective of the measure of trade, finance when proxied by private credit does not promote trade while domestic credit positively affects trade. Thus, the evidence suggests that the precise impact of finance is conditioned on the indicator used in measuring financial sector development. Improving the level of private (domestic) credit dampens (amplifies) exports and trade openness. While private credit is not trade–enhancing, the concern is now on the monotonicity of the relationship and whether financial underdevelopment is good for trade. There is evidence to suggest that the impact of private credit on trade is non-linear and U–shaped with a threshold

of 288% for exports and 230% for trade openness. The implication is that spurring trade on the back of private credit development is possible once these thresholds are exceeded. Thus, financial systems may be detrimental (helpful) to trade for economies with low (high) level of domestic credit. Unfortunately, none of the countries considered has attained such minimum level of private credit at least based on the sample evidence. There is no threshold effect of domestic credit. This finding potentially resolves the conflicting results in finance–trade literature.

Given the finance-trade nexus, the study investigated for a possible channel through which financial sector development influences trade. Indeed, higher financial development is expected to increase economic growth given the functions the financial markets play in resource allocation and financial intermediation. To the extent that economic growth potentially improves trade suggests an indirect effect of finance on trade through economic growth. However, the multiplicative interactive terms of finance and economic growth proxied by real GDP per capita do not provide support for the conditional effect of finance. Perhaps the underdeveloped financial system coupled with the low income levels of countries in Africa is insufficient to trigger any significant joint effect on trade.

To ensure sustained trade, the recommendation is that of improving domestic level of credit in a way that does not trigger incidences of hypertrophic finance. On this score, strengthening institutions to exact proper oversight of the financial sector is needed guided by the optimal and healthy levels of finance consistent with the continent's international trade course.

### **CHAPTER SIX**

## EMPIRICAL RESULTS: THRESHOLD EFFECTS OF FINANCIAL SECTOR DEVELOPMENT ON INTERNATIONAL TRADE

### 6.1 Introduction

This chapter presents the empirical results on the threshold effect of financial sector development on international trade based on the sample splitting approach. Relative to the use of a quadratic square term in examining possible nonlinearities, in addition to identifying the unique threshold value, the approach adopted in this chapter also reveals how financial development affects international trade below and above the threshold. The next section presents the empirical results and discussions.

#### 6.2 Findings and Discussions

The second objective of this study is to examine nonlinearity in finance-trade nexus as well as the impact of finance on trade when the level of country's domestic financial development is below and above the threshold. In this regard, the first step here is to determine whether or not the relationship is monotonic. We test the null hypothesis of linearity against the alternative hypothesis of a threshold model. Specifically, the thesis examines whether finance-international trade nexus is conditioned on the level of domestic financial sector development. In doing so, the study investigated whether private and domestic credits and their individual relationships with exports and trade openness are nonlinear. We examine the statistical significance of the threshold moderating variables (private and domestic credits). Since the estimations permit the testing for the existence of one threshold value, the threshold value is not identified under the null hypothesis of no threshold effect.

To examine the importance of the sample split, this study bootstrapped the p-values which are asymptotically precise (Hansen, 1996) while compute the p-values relying on the bootstrap approach with 2,000 replications and 15% trimming percentage. Rejection of the null hypothesis suggests the need for the sample to be split based on a unique threshold value of the threshold variable. Table 6.1 presents results on the threshold existence test while the descriptive statistics of each of the countries are presented in Appendix 2.

| Countries               |                             | Dependent va              | riable: Exports          |                           | Dependent variable: Trade openness |                           |                                      |                           |  |  |
|-------------------------|-----------------------------|---------------------------|--------------------------|---------------------------|------------------------------------|---------------------------|--------------------------------------|---------------------------|--|--|
|                         | Threshold varial            | oles: Private credit      | Threshold variab         | oles: Domestic credit     | Threshold varial                   | bles: Private credit      | Threshold variables: Domestic credit |                           |  |  |
|                         | LM–test for no<br>threshold | Bootstrap <i>p</i> -value | LM-test for no threshold | Bootstrap <i>p</i> -value | LM-test for no<br>threshold        | Bootstrap <i>p</i> -value | LM-test for no threshold             | Bootstrap <i>p</i> -value |  |  |
| Algeria                 | 15.80                       | 0.000***                  | 10.12                    | 0.020**                   | 14.26                              | 0.001***                  | 9.11                                 | 0.030**                   |  |  |
| Angola                  | _                           | 1.000                     | -                        | 1.000                     | _                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Benin                   | 19.13                       | 0.000***                  | 19.25                    | 0.000***                  | 15.06                              | 0.000***                  | 16.89                                | 0.000***                  |  |  |
| Botswana                | _                           | 1.000                     | -                        | 1.000                     | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Burundi                 | 8.33                        | 0.072*                    | 11.11                    | 0.006***                  | 7.23                               | 0.189                     | 4.03                                 | 0.827                     |  |  |
| Burkina Faso            | 13.09                       | 0.002***                  | 19.01                    | 0.000***                  | 13.38                              | 0.001***                  | 13.31                                | 0.001***                  |  |  |
| Cape Verde              | _                           | 1.000                     | -                        | 1.000                     | _                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Cameroon                | 10.96                       | 0.010**                   | 6.67                     | 0.248                     | 7.61                               | 0.148                     | 5.74                                 | 0.406                     |  |  |
| Central African<br>Rep. | 15.78                       | 0.001***                  | 11.35                    | 0.014**                   | 17.27                              | 0.000***                  | 10.47                                | 0.019*                    |  |  |
| Chad                    | 14.64                       | 0.000***                  | 16.49                    | 0.000***                  | 17.08                              | 0.000***                  | 10.26                                | 0.008***                  |  |  |

 Table 6.1:
 Testing for existence of threshold

Note: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively.

|                   |                             | Dependent var             | iable: Exports              | <u>,</u>                  | Dependent variable: Trade openness |                           |                                      |                           |  |  |
|-------------------|-----------------------------|---------------------------|-----------------------------|---------------------------|------------------------------------|---------------------------|--------------------------------------|---------------------------|--|--|
| Countries         | Threshold varia             | bles: Private credit      | Threshold variab            | oles: Domestic credit     | Threshold varia                    | bles: Private credit      | Threshold variables: Domestic credit |                           |  |  |
|                   | LM–test for no<br>threshold | Bootstrap <i>p</i> –value | LM–test for no<br>threshold | Bootstrap <i>p</i> -value | LM–test for no<br>threshold        | Bootstrap <i>p</i> -value | LM-test for no<br>threshold          | Bootstrap <i>p</i> -value |  |  |
| Congo, Dem. Rep.  | _                           | 1.000                     | _                           | 1.000                     | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Congo, Rep        | 7.246                       | 0.197                     | 11.700                      | 0.007*                    | 5.33                               | 0.522                     | 11.71                                | 0.001***                  |  |  |
| Cote d'Ivoire     | 13.72                       | 0.001***                  | 14.66                       | 0.000*                    | 17.64                              | 0.000***                  | 15.64                                | 0.000***                  |  |  |
| Ethiopia          | 11.73                       | 0.005***                  | 4.80                        | 0.680                     | 11.13                              | 0.008***                  | 5.76                                 | 0.449                     |  |  |
| Egypt Arab Rep.   | _                           | 1.000                     | -                           | 1.000                     | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Equatorial Guinea | -                           | 1.000                     | _                           | 1.000                     | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Gabon             | 13.61                       | 0.001***                  | 7.88                        | 0.147                     | 12.25                              | 0.001***                  | 7.99                                 | 0.106                     |  |  |
| Ghana             | -                           | 1.000                     | -                           | 1.000                     | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| The Gambia        | -                           | 1.000                     | -                           | 1.000                     | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Guinea            | -                           | 1.000                     | _                           | 1.000                     | _                                  | 1.000                     | -                                    | 1.000                     |  |  |

| Table 6.1: | Testing for existence of threshold (continued) |
|------------|--|
|------------|--|

Note: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively.

|               |                          | Dependent var              | iable: Exports           |                            | Dependent variable: Trade openness |                           |                                      |                           |  |  |
|---------------|--------------------------|----------------------------|--------------------------|----------------------------|------------------------------------|---------------------------|--------------------------------------|---------------------------|--|--|
| Countries     | Threshold variab         | les: Private credit        | Threshold varia<br>cre   | bles: Domestic<br>dit      | Threshold var<br>cre               | iables: Private<br>edit   | Threshold variables: Domestic credit |                           |  |  |
|               | LM-test for no threshold | Bootstrap <i>p</i> – value | LM-test for no threshold | Bootstrap <i>p</i> – value | LM-test for<br>no threshold        | Bootstrap <i>p</i> -value | LM-test for<br>no threshold          | Bootstrap <i>p</i> -value |  |  |
| Guinea–Bissau | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | —                                    | 1.000                     |  |  |
| Kenya         | 8.28                     | 0.080*                     | 3.64                     | 0.914                      | 5.42                               | 0.515                     | 7.54                                 | 0.148                     |  |  |
| Lesotho       | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Liberia       | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Libya         | _                        | 1.000                      | _                        | 1.000                      | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Malawi        | 9.07                     | 0.042**                    | 8.85                     | 0.046**                    | 6.82                               | 0.183                     | 8.33                                 | 0.066*                    |  |  |
| Mali          | 9.63                     | 0.034**                    | 9.06                     | 0.041**                    | 8.51                               | 0.083*                    | 7.05                                 | 0.225                     |  |  |
| Mauritania    | _                        | 1.000                      | -                        | 1.000                      | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Mauritius     | _                        | 1.000                      | -                        | 1.000                      | -                                  | 1.000                     | -                                    | 1.000                     |  |  |
| Morocco       | _                        | 1.000                      | 9.74                     | 0.026**                    | -                                  | 1.000                     | 12.85                                | 0.002***                  |  |  |
| Mozambique    | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Namibia       | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Niger         | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |
| Nigeria       | _                        | 1.000                      | _                        | 1.000                      | _                                  | 1.000                     | _                                    | 1.000                     |  |  |

### Table 6.1: Testing for existence of threshold (continued)

Note: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively.
|              |                             | Dependent va              | riable: Exports          | <u>,</u>                  |                          | Dependent variab          | le: Trade openness       |                           |
|--------------|-----------------------------|---------------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|---------------------------|
| Countries    | Threshold varia             | bles: Private credit      | Threshold variab         | oles: Domestic credit     | Threshold varia          | ables: Private credit     | Threshold varial         | oles: Domestic credit     |
|              | LM-test for no<br>threshold | Bootstrap <i>p</i> -value | LM-test for no threshold | Bootstrap <i>p</i> -value | LM-test for no threshold | Bootstrap <i>p</i> -value | LM–test for no threshold | Bootstrap <i>p</i> -value |
| Rwanda       | 10.91                       | 0.011**                   | 9.76                     | 0.055*                    | 7.09                     | 0.166                     | 7.09                     | 0.166                     |
| Senegal      | 20.21                       | 0.000*                    | 21.42                    | 0.000**                   | 12.42                    | 0.003***                  | 11.24                    | .005                      |
| Sierra Leone | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |
| South Africa | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |
| Sudan        | 9.50                        | 0.046**                   | 8.18                     | 0.116                     | 12.33                    | 0.003***                  | 7.38                     | 0.178                     |
| Swaziland    | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |
| Tanzania     | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |
| Togo         | 8.96                        | 0.047**                   | 11.12                    | 0.009***                  | 12.25                    | 0.003***                  | 13.76                    | 0.000***                  |
| Tunisia      | 9.96                        | 0.025**                   | 8.85                     | 0.159                     | 10.49                    | 0.022**                   | 10.05                    | 0.028**                   |
| Uganda       | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |
| Zambia       | —                           | 1.000                     | _                        | 1.000                     | -                        | 1.000                     | _                        | 1.000                     |
| Zimbabwe     | _                           | 1.000                     | _                        | 1.000                     | _                        | 1.000                     | _                        | 1.000                     |

#### Table 6.1: Testing for existence of threshold (continued)

Note: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively.

From Table 6.1, there is no evidence of threshold for 26, representing 57%, of the 46 countries under consideration.<sup>8</sup> For these countries, the study fails to reject the null hypothesis of no threshold given the rather high p-values and in some cases indeterminate LM-test statistics. This finding suggests that, for these countries, finance-trade nexus is not threshold-specific and that the impact of financial development and international trade do not depend on private and domestic credits attaining a certain value. There is therefore an evidence of a linear relationship between finance and trade. This holds irrespective of the measure of international trade and financial development. For the remaining 20 countries, there is evidence of either a complete or incomplete nonlinearity in finance-trade link.

Further findings from the threshold tests show evidence that the relationship between finance and trade in seven out of the 20 countries reveal the existence of complete nonlinearity. These countries are Algeria, Benin, Burkina Faso, Central African Republic, Chad, Cote d'Ivoire and Togo. For instance, beginning with exports as the dependent variable, the study found that for Algeria, the relationship between private and domestic credits and export exhibit threshold effect given the rejection of the null hypothesis. The existence of a threshold here is significant at conventional levels for both private and domestic credits. Similarly, we reject the null hypothesis of no threshold given the large *LM* tests for both trade openness and financial development proxies. Thus, given the low bootstrap p-values of these countries, this outcome suggests that the sample can be split into two unique regimes where the impact of financial development on international trade is determined by the level of financial development. By invoking the Hansen's (2010) threshold test, we show threshold graphs of

<sup>&</sup>lt;sup>8</sup> These countries are Angola, Botswana, Cape Verde, Congo Democratic Republic, Congo Republic, Egypt Arab Republic, Equatorial Guinea, Ghana, The Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Libya, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

the normalized  $LR(\alpha)$  as a function of the financial development thresholds. The evidence on the threshold effect for these countries is further strengthened by the plots where the threshold variables – private and domestic credits – cross the 95% critical value line (see Appendix 4). Thus for these countries, private and domestic credits as measures of finance impacts on exports and trade openness in a nonlinear fashion.

For the remaining 13 out of the 20 countries<sup>9</sup>, there is evidence of incomplete threshold where at most one indicator of finance is nonlinearly related to either exports or trade openness or both. Specifically, for Burundi, Malawi, Mali, Rwanda and Senegal, there is evidence that all the indicators of finance exhibit nonlinear relationship with exports. Interestingly, for the two proxies of finance, only private credit has threshold effects on both measures of international trade in Ethiopia, Gabon and Sudan while only domestic credit is also nonlinearly related to exports and trade openness in Congo Republic and Morocco. The implication is that the impact of financial sector development on international trade is conditioned on the threshold value of the respective threshold variables in each of these countries. For the other three countries, private and domestic credits exhibit threshold effects on trade openness in Tunisia while only private credit is nonlinearly related to exports. In both Cameroon and Kenya, there is evidence to the effect that only private credit and exports are also nonlinearly related.

From the foregoing, the findings provide credence that, the relationship between financial development and international trade is conditioned on financial development attaining a unique threshold point above which the impact of financial development on trade changes. Given this evidence, we classify country's level of financial development into high and low

<sup>&</sup>lt;sup>9</sup> These 13 countries are Burundi, Cameroon, Congo Republic, Ethiopia, Gabon, Kenya, Malawi, Mali, Morocco, Rwanda, Senegal, Sudan and Tunisia.

regime periods with those above (below) the threshold value is taken to mean high (low) regime. While regime 1 is taken to denote a period where financial sector development is below the threshold, regime 2 denotes a period where financial development is above the threshold.

Having established the existence of financial development threshold in 20 countries, the next logical step is to examine how finance impacts on international trade when the level of finance is below and above the inflection point. The following Tables present results on the threshold effects of finance on trade for countries with evidence of complete or incomplete thresholds.

|  |                          |                                   | Dependent v                 | riable: Expor            | te   |                       | Dependent variable: Trade openness |                                  |                                   |                          |                                   |                                   |
|--|--------------------------|-----------------------------------|-----------------------------|--------------------------|--|-----------------------|------------------------------------|----------------------------------|-----------------------------------|--------------------------|-----------------------------------|-----------------------------------|
|  | Linear<br>model          | Threshol<br>Threshold van<br>cree | d model:<br>riable: Private | Linear<br>model          | Linear<br>model Threshold model:<br>Threshold variable: Domestic<br>credit |                       | Linear<br>model                    | Threshol<br>Threshold var<br>cre | d model:<br>iable: Private<br>dit | Linear<br>model          | Threshold<br>Threshold<br>Domesti | l model:<br>variable:<br>c credit |
|  | Global<br>OLS<br>without | Regime 1 $[q \le \eta]$           | Regime 2 $[q > \eta]$       | Global<br>OLS<br>without | Regime 1 $[q \le \eta]$  | Regime 2 $[q > \eta]$ | Global<br>OLS<br>without           | Regime 1 $[q \le \eta]$          | Regime 2 $[q > \eta]$             | Global<br>OLS<br>without | Regime 1 $[q \le \eta]$           | Regime 2 $[q > \eta]$             |
|  | threshold                |                                   |                             | threshold                |  | Algor                 | threshold                          |                                  |                                   | threshold                |                                   |                                   |
| Private credit                             | -0.187***<br>(0.043)     | -0.820<br>(0.808)                 | -0.437***<br>(0.094)        | -                        | _  | –                     | -0.175***<br>(0.055)               | -1.727***<br>(0.541)             | -1.495***<br>(0.257)              | _                        | -                                 | -                                 |
| Domestic credit                            | -                        | -                                 | _                           | -0.243***<br>(0.029)     | -0.330***<br>(0.086)   | -0.165***<br>(0.046)  | _                                  | _                                | _                                 | -0.231***<br>(0.033)     | -0.265***<br>(0.027)              | -0.692***<br>(0.122)              |
| Real GDP per capita                        | 0.007***<br>(0.002)      | 0.026***<br>(0.005)               | -0.011***<br>(0.004)        | -0.001<br>(0.002)        | $-0.014^{***}$<br>(0.002)  | -0.001<br>(0.001)     | 0.012***<br>(0.002)                | 0.027***<br>(0.005)              | 0.051***<br>(0.011)               | 0.004*<br>(0.002)        | 0.004***<br>(0.001)               | 0.028***<br>(0.008)               |
| Mean of finance                            |                          | 27.5                              | 59%                         |                          | 42.0   | 4%                    | (,                                 | 27.5                             | 9%                                | (,                       | 42.0                              | 4%                                |
| Threshold value ( $\eta$ )                 |                          | 12.9                              | 99%                         |                          | 37.8   | 0%                    |                                    | 23.7                             | 1%                                |                          | 56.1                              | 4%                                |
| 95% confidence interval                    |                          | [12.20%,                          | 23.71%]                     |                          | [3.65%,  | 59.63%]               |                                    | [12.20%,                         | 46.29%]                           |                          | [56.14%,                          | 59.63%]                           |
| Observations<br>Joint <i>R</i> -squared    | 37<br>0.77               | 17                                | 20                          | 37<br>0.76               | 15   | 22                    | 37<br>0.76                         | 25                               | 12                                | 37<br>0.85               | 24                                | 13                                |
| R-squared                                  |                          | 0.85                              | 0.59                        |                          | 0.04   | 0.33                  |                                    | 0.68                             | 0.70                              |                          | 0.81                              | 0.76                              |
| value)                                     |                          | 0.754                             |                             |                          | 0.971  |                       |                                    | 0.920                            |                                   |                          | 0.273                             |                                   |
|  |                          |                                   |                             |                          |  | Beni                  | n                                  |                                  |                                   |                          |                                   |                                   |
| Private credit                             | -0.221***<br>(0.081)     | -0.693***<br>(0.128)              | 0.158<br>(0.181)            | -                        | -  | _                     | -0.071<br>(0.135)                  | -1.225***<br>(0.210)             | 0.878***<br>(0.231)               | _                        | _                                 | _                                 |
| Domestic credit                            | -                        | -                                 | _                           | -0.121<br>(0.077)        | -0.156<br>(0.208)  | 0.045<br>(0.148)      | _                                  | -                                | _                                 | -0.002<br>(0.123)        | $-0.844^{**}$<br>(0.414)          | 0.251<br>(0.228)                  |
| Real GDP per capita                        | 0.032 (0.008)            | -0.052<br>(0.008)                 | 0.060<br>(0.008)            | 0.032 (0.009)            | -0.059***<br>(0.015)   | 0.054***<br>(0.007)   | 0.057***<br>(0.016)                | -0.080***<br>(0.013)             | 0.113***<br>(0.012)               | 0.058***<br>(0.016)      | -0.103***<br>(0.032)              | 0.092***<br>(0.014)               |
| Mean of finance<br>Threshold estimate      |                          | 17.0<br>15.3                      | 54%<br>38%                  |                          | 16.4<br>12.6   | 3%<br>4%              |                                    | 17.6<br>15.3                     | 54%<br>88%                        |                          | 16.4<br>12.6                      | 3%<br>5%                          |
| 95% confidence interval                    |                          | [13.99%,                          | 15.38%]                     |                          | [10.94%,   | 19.13%]               |                                    | [13.99%,                         | 15.38%]                           |                          | [10.94%,                          | 19.50%]                           |
| Observations Joint <i>R</i> -squared       | 37<br>0.83               | 16                                | 21                          | 37<br>0.76               | 16   | 21                    | 37<br>0.76                         | 16                               | 21                                | 37<br>0.655              | 16                                | 21                                |
| R-squared                                  |                          | 0.83                              | 0.83                        |                          | 0.60   | 0.79                  |                                    | 0.70                             | 0.78                              |                          | 0.51                              | 0.70                              |
| Heteroskedasticity test ( <i>p</i> -value) |                          | 0.353                             |                             |                          | 0.833  |                       |                                    | 0.703                            |                                   |                          | 0.989                             |                                   |

|  | <b>Table 6.2:</b> | Threshold | estimation | effects in | Algeria | and Benin |
|--|-------------------|-----------|------------|------------|---------|-----------|
|--|-------------------|-----------|------------|------------|---------|-----------|

Beginning with Algeria in Table 6.2, we find a negative and significant effect of finance on international trade. Specifically, without a threshold, a unit–percentage rise in private and domestic credits significantly reduce exports by 0.187% and 0.243% respectively. Since the data favours a threshold model, it establishes a point estimate of 12.99% for private credit and 37.80% for domestic credit with respective confidence intervals of (12.20%, 23.71%) and (3.65%, 59.63%). However, in regime 1 where private credit is below the threshold, changes in private credit do not affect trade although the coefficient is negative. In regime 2, the impact of private credit on exports remains negative and gains significance at 1%. In particular, above the threshold, a 1% increase in private credit inhibits exports by 0.437%. With regard to domestic credit—exports nexus, it is evident that, the impact of domestic credit is below its threshold, a unit–percentage increase in finance decreases trade by 0.330% but drags trade by 0.165% when finance falls above the threshold. Notice that for both private and domestic credits, the impact of financial development on exports is less damaging when these thresholds are exceeded as the coefficients in regimes 2 are less negative relative to regime 1.

Turning to the finance-trade openness nexus, this study finds that, while financial development negatively and significantly affects trade openness, the precise impact is disproportionate given the threshold level. We find threshold values of 23.71% and 56.14% for private and domestic credits respectively with corresponding confidence intervals of (12.20%, 46.29%) and (56.14%, 59.63%). With regard to private credit, the data reveals that irrespective of the regime, trade openness decreases by more than proportionate increase in private credit although the damaging effect of finance is lower in regime 2. For domestic credit, while a unit-percentage increase in finance significantly decreases trade by 0.265%

when domestic credit is below the threshold, above the threshold, the effect is more damaging given the higher coefficient of 0.692%.

Domestic credit-trade openness link is however an exception. Here, unbridled domestic credit-to-GDP above the threshold is not trade-enhancing. While higher financial development does not promote international trade in Algeria, the deleterious effect is more pronounced in private credit relative to domestic credit. Overall, the average levels of financial development are above their respective thresholds where the detrimental effect of finance on trade diminishes. According to Leibovici (2016), financial friction as a typical trait of low financial markets lowers the export share of firms hence the overall share of output sold at the international markets. This is because financial under-development is often associated with credit constraints thus limiting firms' ability to meet sunk and fixed costs associated with cross-border trade. As a consequence, both export volumes and openness are low under less developed financial sectors. However, the data shows that once the financial sector develops above the minimum threshold the deleterious effect of finance weakens.

With regard to real GDP effect on trade, the finding shows varying impacts. For instance, under finance–exports nexus, the impact of economic growth is regime–specific where real GDP per capita promote (damages) exports when private credit is below (above) the threshold. For domestic credit–export link, the impact of real GDP per capita on exports is negative although the effect is significant in regime 1. For financial development–trade openness relationship, economic growth positively and significantly influences trade irrespective of the threshold and indicator of finance. However, for both private and domestic credit thresholds, the trade–enhancing effect of economic growth is consistently huge when the thresholds are exceeded.

98

Turning to Benin, the evidence suggests that without the threshold, private credit negatively affects international trade. However, only the impact of private credit on exports is significant. For domestic credit, none of the linear estimate is significant. To the extent that evidence from the data supports the threshold existence, we find inflection points of 15.38% for private credit and 12.64% for domestic credit. Given these points, the analysis shows that both private and domestic credits exceed these thresholds in 21 out of the 37 observations. Below the private credit threshold, 1% increase in private credit significantly decreases exports by 0.693% but has an insignificant effect above the threshold. Conversely, below the 15.38% private credit threshold, financial sector significantly inhibits trade openness. While there is a deleterious effect of finance on international trade at low regimes of finance, the impact of private credit is more damaging on trade openness and measures at least 1.8 times higher than the impact on exports. On the other hand, above the threshold, private credit positively affects exports and trade openness although only the impact on the latter is significant. Specifically, the coefficient of private credit is 0.878, suggesting that welldeveloped financial sector spurs trade openness. With regard to domestic credit-trade nexus, there is no evidence of any significant effect of domestic credit on export irrespective of whether or not there is a control for threshold. For trade openness, the impact is negative and significant when domestic credit falls below the threshold. Above the threshold, the impact of domestic credit on trade openness is insignificant although positive. Turning to the control variable, the data reveals that when the relationship between finance and exports is mediated by the level of private credit, economic growth has no impact on exports in Benin. However, where finance-exports nexus is mediated by domestic credit, there is evidence to depict that below the threshold value, economic growth negatively and significantly affects exports. This impact reverses in the direction of effect when domestic credit exceeds the threshold. For trade openness and finance link, our findings show that, real GDP per capita does not

enhance international trade when both proxies of finance are below their respective thresholds but changes sign with higher levels of financial development. Thus, economic growth spurs trade under well-developed domestic financial sector. In these specifications, the values of the R-squares are moderately higher in regime 2, suggesting that above the threshold values of financial development, at least 70% of the variations in international trade are accounted for by variations in our set of independent variables.

|   |                     |                                | Dependent var                        | iable: Exports              | 8                               |                                      | Dependent variable: Trade openness |                                   |                                 |                     |                                |                                      |  |
|---|---------------------|--------------------------------|--------------------------------------|-----------------------------|---------------------------------|--------------------------------------|------------------------------------|-----------------------------------|---------------------------------|---------------------|--------------------------------|--------------------------------------|--|
|   | Linear<br>model     | Thresho<br>Threshold va<br>cre | ld model:<br>riable: Private<br>edit | Linear<br>model             | Threshol<br>Threshold<br>Domest | d model:<br>l variable:<br>ic credit | Linear<br>model                    | Threshold<br>Threshold<br>Private | d model:<br>variable:<br>credit | Linear<br>model     | Thresho<br>Threshold var<br>cr | ld model:<br>iable: Domestic<br>edit |  |
|   | Global              | Pagima 1                       | Pagima 2                             | Global                      | Pagima 1                        | Pagima 2                             | Global                             | Pagima 1                          | Pagima 2                        | Global              | Pagima 1                       | Pagima 2                             |  |
|   | without             | [n < n]                        | [a > n]                              | without                     | [n < n]                         | [a > n]                              | without                            | $[\alpha < n]$                    | [a > n]                         | without             | [a < n]                        | [a > n]                              |  |
|   | threshold           | $[\mathbf{q} = \mathbf{\eta}]$ | [4 > 1]                              | threshold                   | $[\mathbf{q}] = \mathbf{q}$     | [9 > 1]]                             | threshold                          | $[\mathbf{q} = \mathbf{q}]$       | [9 > 1]]                        | threshold           | $[\mathbf{q} \ge \mathbf{q}]$  | [9 > 1]]                             |  |
|   |                     |                                |                                      |                             |                                 | Bu                                   | rkina Faso                         |                                   |                                 | -                   |                                |                                      |  |
| Private credit                                | 0.453***<br>(0.147) | -0.243<br>(0.148)              | 0.257<br>(0.245)                     | -                           | _                               | -                                    | 1.274***<br>(0.286)                | 0.359<br>(0.267)                  | 0.869**<br>(0.404)              | -                   | _                              | _                                    |  |
| Domestic credit                               | —                   | _                              | _                                    | 0.451***<br>(0.135)         | -0.301**<br>(0.130)             | -0.065<br>(0.134)                    | —                                  | _                                 | _                               | 1.323***<br>(0.221) | 0.228<br>(0.295)               | 0.322<br>(0.303)                     |  |
| Real GDP per capita                           | 0.028***<br>(0.007) | 0.002<br>(0.003)               | 0.048***<br>(0.008)                  | 0.023***<br>(0.008)         | 0.008**<br>(0.003)              | 0.089<br>(0.054)                     | 0.030**<br>(0.013)                 | -0.020***<br>(0.006)              | 0.083***<br>(0.012)             | 0.013<br>(0.013)    | -0.013*<br>(0.007)             | 0.147<br>(0.122)                     |  |
| Mean of finance<br>Threshold value            |                     | 13.<br>15.                     | 86%<br>51%                           |                             | 13.6<br>15.5                    | 57%<br>53%                           |                                    | 13.8<br>15.5                      | 6%<br>51%                       |                     | 13.<br>15.                     | .67%<br>.53%                         |  |
| 95% confidence interval                       |                     | [15.51%,                       | 15.51%]                              | [14.96%, 15.53%]<br>37 30 7 |                                 |                                      | [15.51%,                           | 15.51%]                           |                                 | [14.37%]            | , 15.53%]                      |                                      |  |
| Observations<br>Joint <i>R</i> –squared       | 37<br>0.89          | 27                             | 10                                   | 37<br>0.94                  | 30                              | 7                                    | 37<br>0.88                         | 27                                | 10                              | 37<br>0.89          | 30                             | 7                                    |  |
| <i>R</i> -squared                             |                     | 0.14                           | 0.83                                 |                             | 0.22                            | 0.50                                 |                                    | 0.19                              | 0.86                            |                     | 0.063                          | 0.62                                 |  |
| test $(p-value)$                              | 0.391               |                                |                                      | 0.487                       |                                 |                                      | 0.566                              |                                   |                                 | 0.919               |                                |                                      |  |
|   |                     |                                |                                      | n                           |                                 |                                      | Burundi                            |                                   |                                 | 1                   |                                |                                      |  |
| Private credit                                | -0.189**<br>(0.071) | $-0.177^{**}$<br>(0.074)       | -0.006<br>(0.197)                    | -                           | _                               | _                                    |                                    |                                   |                                 |                     |                                |                                      |  |
| Domestic credit                               | -                   | _                              | _                                    | -0.173<br>(0.104)           | 1.154***<br>(0.142)             | -0.128<br>(0.094)                    | -                                  | -                                 | -                               | -                   | _                              | -                                    |  |
| Real GDP per capita                           | 0.013<br>(0.008)    | -0.006<br>(0.008)              | 0.050***<br>(0.008)                  | 0.017<br>(0.010)            | -0.073***<br>(0.009)            | 0.034***<br>(0.011)                  | _                                  | _                                 | _                               | -                   | _                              | _                                    |  |
| Mean of finance<br>Threshold value            |                     | 12. <sup>*</sup><br>14.*       | 79%<br>03%                           |                             | 21.6<br>18.1                    | 54%<br>14%                           | _                                  | _                                 | _                               | _                   | _                              | _                                    |  |
| 95% confidence interval                       |                     | [10.72%,                       | 14.23%]                              |                             | [16.83%,                        | 19.94%]                              |                                    |                                   |                                 |                     |                                |                                      |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.60          | 18                             | 19                                   | 37<br>0.68                  | 10                              | 27                                   |                                    |                                   |                                 |                     |                                |                                      |  |
| <i>R</i> –squared                             |                     | 0.14                           | 0.29                                 |                             | 0.81                            | 0.55                                 |                                    |                                   |                                 |                     |                                |                                      |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) |                     | 0.931                          |                                      | 0.81 0.55 0.375             |                                 |                                      |                                    |                                   |                                 |                     |                                |                                      |  |

#### Table 6.3: Threshold estimation effects in Burkina Faso and Burundi

For Burkina Faso where the study also found a complete threshold, we find a threshold of 15.51% for private credit and 15.53% for domestic credit. Interestingly, while the threshold value of private credit is exactly the confidence interval value of (15.51%, 15.51%), domestic credit threshold lies within 14.96% and 15.53%. Note that the confidence interval of private credit is exactly the same as the threshold value suggesting that the threshold value is precise. On the impact of private credit, the study finds that, without the threshold, private credit positively and significantly influences exports with a benign effect when the threshold is considered. In other words, in both regimes, the private credit does not significantly drive exports although the impact is positive above the threshold. For trade openness, private credit positively affects trade openness. However, below the threshold, financial development-trade link is insignificant. In regime 2, the impact is significant at 5% where a unit-percentage rise in private credit increases trade openness by 0.869%. On domestic credit-exports nexus, although domestic credit positively and significantly influences exports, it damages trade at low levels of domestic credit and above the threshold, the link is flatly insignificant. In the case of domestic credit and trade openness, the relationship is insignificant in both regimes. With regard to the control, when private credit referees the link between finance and exports, economic growth significantly affects exports in regime 2. The reverse holds when domestic credit mediates the relationship between finance and exports. For trade openness, the impact of real GDP per capita is negative (positive) at low (high) regime mediated by private credit. For domestic credit threshold, economic growth significantly inhibits trade openness in regime 1 with a positive coefficient in regime 2 albeit insignificantly.

In the case of Burundi, the data supports threshold effects for only financial development and exports but not trade openness. There is an inflection point of 14.03% and 18.14% for private and domestic credits respectively. For both thresholds, finance does not significantly

influence exports above their respective threshold values. This study, however, found varying impact of finance at their low levels. For instance, in regime 1, while private credit negatively and significantly affects exports, domestic credit promotes trade when its level is below the threshold. Here, the trade–enhancing effect of domestic credit is exceedingly higher than the damaging effect of private credit. In the case of economic growth, while its impact in regime 1 is negative at both indicators of finance, it is only significant on exports when finance–trade link is moderated by domestic credit. Above both thresholds, a unit–percentage increase in real GDP per capita significantly increases exports by 0.050% and 0.034% when the relationship is respectively referred by private and domestic credits. Interestingly, the R–squares are consistently higher when domestic credit is the threshold variable suggesting that in this estimation, majority of the variations in exports are explained by variations in domestic credit and economic growth.

|   |  |                                  |                                     |                      |                                 |                                      | 1<br>1                             |                                  |                                     |                      |                                 |                                      |  |
|---|--|----------------------------------|-------------------------------------|----------------------|---------------------------------|--------------------------------------|------------------------------------|----------------------------------|-------------------------------------|----------------------|---------------------------------|--------------------------------------|--|
|   |  |                                  | Dependent var                       | riable: Expor        | ts                              |                                      | Dependent variable: Trade openness |                                  |                                     |                      |                                 |                                      |  |
|   | Linear<br>model                            | Threshol<br>Threshold<br>Private | d model:<br>l variable:<br>e credit | Linear<br>model      | Threshol<br>Threshold<br>Domest | d model:<br>l variable:<br>ic credit | Linear<br>model                    | Threshol<br>Thresholo<br>Private | d model:<br>l variable:<br>e credit | Linear<br>model      | Threshol<br>Threshold<br>Domest | d model:<br>l variable:<br>ic credit |  |
|   | Global<br>OLS                              | Regime 1                         | Regime 2                            | Global<br>OLS        | Regime 1                        | Regime 2                             | Global<br>OLS                      | Regime 1                         | Regime 2                            | Global<br>OLS        | Regime 1                        | Regime 2                             |  |
|   | without<br>threshold                       | $[q \le \eta]$                   | $[q > \eta]$                        | without<br>threshold | $[q \leq \eta]$                 | $[q > \eta]$                         | without<br>threshold               | $[q \leq \eta]$                  | $[q > \eta]$                        | without<br>threshold | $[q \le \eta]$                  | $[q > \eta]$                         |  |
|   |  |                                  |                                     | •                    |                                 | Cam                                  | eroon                              |                                  |                                     | •                    |                                 |                                      |  |
| Private credit                                | 0.088<br>(0.138)                           | -0.436*<br>(0.231)               | 2.065***<br>(0.565)                 | —                    | —                               | _                                    | -                                  | —                                | —                                   | -                    | -                               | -                                    |  |
| Domestic credit                               | _  | _                                | _                                   | -                    | _                               | -                                    | _                                  | _                                | _                                   | -                    | —                               | -                                    |  |
| Real GDP per capita                           | 0.007<br>(0.007)                           | 0.023**<br>(0.009)               | -0.003<br>(0.003)                   | -                    | _                               | -                                    | -                                  | _                                | _                                   | -                    | _                               | -                                    |  |
| Mean of finance<br>Threshold value            |  | 16.0<br>25.2                     | )3%<br>23%                          |                      |                                 |                                      |                                    |                                  |                                     |                      |                                 |                                      |  |
| 95% confidence<br>interval                    |  | [22.89%,                         | 25.23%]                             | —                    | —                               | —                                    | —                                  | —                                | —                                   | —                    | —                               | _                                    |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.45                                 | 30                               | 7                                   |                      |                                 |                                      |                                    |                                  |                                     |                      |                                 |                                      |  |
| R-squared                                     |  | 0.30                             | 0.66                                |                      |                                 |                                      |                                    |                                  |                                     |                      |                                 |                                      |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) |  | 0.127                            |                                     |                      |                                 |                                      |                                    |                                  |                                     |                      |                                 |                                      |  |
|   |  |                                  |                                     |                      |                                 | <b>Central Afri</b>                  | can Republic                       | 2                                |                                     |                      |                                 |                                      |  |
| Private credit                                | -0.207<br>(0.197)                          | -2.584***<br>(0.359)             | 0.849<br>(0.569)                    | -                    | _                               | -                                    | 0.767*<br>(-0.402)                 | -3.876***<br>(0.577)             | -2.365<br>(7.327)                   | —                    | _                               | _                                    |  |
| Domestic credit                               | _  | _                                | —                                   | -0.200*<br>(0.111)   | -1.349***<br>(0.165)            | 0.564<br>(0.336)                     | —                                  | —                                | —                                   | 0.228<br>(0.234)     | -0.271<br>(0.393)               | -0.961<br>(0.824)                    |  |
| Real GDP per capita                           | 0.034***<br>(0.007)                        | 0.083***<br>(0.017)              | 0.049***<br>(0.003)                 | 0.025**<br>(0.011)   | 0.003<br>(0.012)                | 0.073***<br>(0.019)                  | 0.054***<br>(0.017)                | 0.174***<br>(0.027)              | 0.034*<br>(0.017)                   | 0.065**<br>(0.025)   | 0.135***<br>(0.027)             | 0.125***<br>(0.044)                  |  |
| Mean of finance<br>Threshold value            | (0.007) (0.017) (0.003)<br>8.06%<br>10.10% |                                  |                                     |                      | 18.0<br>18.2                    | )4%<br>24%                           |                                    | 8.0<br>10.                       | 6%<br>10%                           |                      | 18.0<br>24.7                    | )4%<br>79%                           |  |
| 95% confidence interval                       |  | [4.90%,                          | 10.10%]                             |                      | [13.10%,                        | 19.10%]                              |                                    | [4.90 %,                         | 10.99%]                             |                      | [12.04%,                        | 25.24%]                              |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.64                                 | 27                               | 10                                  | 37<br>0.59           | 24                              | 13                                   | 37<br>0.62                         | 27                               | 10                                  | 37<br>0.49           | 31                              | 6                                    |  |
| <i>R</i> –squared                             |  | 0.60                             | 0.69                                |                      | 0.67                            | 0.51                                 |                                    | 0.63                             | 0.39                                |                      | 0.43                            | 0.77                                 |  |
| Heteroskedasticity test ( <i>p</i> -value)    | 0.64<br>0.60 0.69<br>0.932                 |                                  |                                     |                      | 0.236                           |                                      |                                    | 0.490                            |                                     |                      | 0.591                           |                                      |  |

#### Table 6.4: Threshold estimation effects in Cameroon and Central African Republic

In Cameroon where an incomplete threshold involving private credit and exports exists, this study suggests that, in regime 1, private credit negatively and significantly affects exports where a 1% rise in private credit reduces trade by 0.436%. In regime 2 where private credit is above the threshold, a unit–percentage increase in private credit significantly increases exports by 2.065%. Thus, in Cameroon, the positive impact of finance is registered under well-developed financial sector where the positive effect is at least 4.7 times larger than the deleterious effect of financial underdevelopment. For economic growth, its impact is positive and significantly in regime 1. In regime 2, the effect of per capita income is negative albeit insignificantly.

Relative to Cameroon, a complete threshold existence is found for Central African Republic. Given this understanding and beginning with private credit threshold effect on exports, the study finds an inflection point of 10.10% with a corresponding confidence interval of 4.90% to 10.10%. Out of the 37 observations, we notice that, in 27 cases, private credit falls below this threshold with the remaining 10 observations having private credit exceedingly higher than the threshold value. On the impact of private credit on exports, the study found that below the threshold, private credit significantly and disproportionately drags exports in Central African Republic. However, under higher private credit above the threshold, the private credit–export link is insignificant although it enters with a positive sign. For private credit threshold effect on trade openness, the evidence shows that while private credit significantly influences trade openness, in regime 1, the impact is significantly negative and huge relative to the positive effect in the global OLS estimation. More importantly, below the threshold, international trade flows shrink by 3.876% following a unit–percentage increase in private credit. However, in regime 2, finance–trade effect is insignificant. The insignificance of private credit effect on trade openness in regime 2 is consistent with the private credit

export nexus. For domestic credit threshold effect on international trade, domestic credit negatively and significantly affects exports in regime 1. However, in regime 2, the impact is imaginary. Interestingly, domestic credit does not appear to affect trade openness in Central African Republic irrespective of whether or not a threshold model is specified. Beyond finance–trade relationship, the study reveals that for each proxy of trade, economic growth largely promotes international trade irrespective of the level of finance.

|   |                                       |  |                                     |  | 8                            | 1                                      |                                    |                                  |                                      |                                    |                                  |                                      |  |
|---|---------------------------------------|--|-------------------------------------|--|------------------------------|--|------------------------------------|----------------------------------|--------------------------------------|------------------------------------|----------------------------------|--------------------------------------|--|
|   |                                       |  | Dependent va                        | ariable: Exports                           |                              |  |                                    | Dep                              | pendent variab                       | le: Trade openi                    | ness                             |                                      |  |
|   | Linear<br>model                       | Threshol<br>Thresholc<br>Private                   | d model:<br>l variable:<br>e credit | Linear<br>model                            | Thresho<br>Threshol<br>Domes | ld model:<br>d variable:<br>tic credit | Linear<br>model                    | Threshol<br>Threshold<br>Private | ld model:<br>l variable:<br>e credit | Linear<br>model                    | Threshol<br>Threshold<br>Domesti | d model:<br>l variable:<br>ic credit |  |
|   | Global<br>OLS<br>without<br>threshold | Regime 1 $[\boldsymbol{q} \leq \boldsymbol{\eta}]$ | Regime 2 $[q > \eta]$               | Global OLS<br>without<br>threshold         | Regime 1 $[q \le \eta]$      | Regime 2 $[q > \eta]$                  | Global OLS<br>without<br>threshold | Regime 1 $[q \le \eta]$          | Regime 2 $[q > \eta]$                | Global OLS<br>without<br>threshold | Regime 1 $[q \le \eta]$          | Regime 2 $[q > \eta]$                |  |
|   |                                       |  |                                     | 1  |                              | С                                      | had                                |                                  |                                      | 1                                  |                                  |                                      |  |
| Private credit                                | -0.504**<br>(0.207)                   | -5.098***<br>(0.523)                               | 0.149<br>(0.154)                    | -  | _                            | _                                      | -1.201***<br>(0.534)               | 14.919<br>(14.104)               | 0.188<br>(0.431)                     | _                                  | -                                | -                                    |  |
| Domestic credit                               | _                                     | -  | _                                   | -0.696***<br>(0.170)                       | -0.061<br>(0.315)            | -0.083<br>(0.152)                      | _                                  | _                                | _                                    | -1.043**<br>(0.284)                | -0.169<br>(1.524)                | 0.496<br>(0.306)                     |  |
| Real GDP per capita                           | 0.052***<br>(0.007)                   | 0.066***<br>(0.004)                                | 0.038***<br>(0.004)                 | 0.047***<br>(0.005)                        | 0.076***<br>(0.014)          | 0.034***<br>(0.004)                    | 0.068***<br>(0.012)                | 0.123***<br>(0.041)              | 0.077***<br>(0.010)                  | 0.063***<br>(0.012)                | -0.002<br>(0.087)                | 0.049***<br>(0.008)                  |  |
| Mean of finance                               |                                       | 6.8  | 7%                                  |  | 11.                          | 51%                                    |                                    | 6.8                              | 7%                                   |                                    | 11.5                             | 51%                                  |  |
| Threshold value                               |                                       | 6.0  | 9%                                  |  | 7.9                          | 91%                                    |                                    | 4.2                              | 1%                                   |                                    | 11.4                             | 6%                                   |  |
| 95% confidence interval                       |                                       | [3.13%,  | 8.40%]                              |  | [7.91%                       | , 7.91%]                               |                                    | [4.21%                           | , 5.95%]                             |                                    | [7.91%,                          | 17.76%]                              |  |
| Observations                                  | 37                                    | 23   | 14                                  | 37   | 10                           | 27                                     | 37                                 | 15                               | 22                                   | 37                                 | 18                               | 19                                   |  |
| Joint R-squared                               | 0.91                                  |  |                                     | 0.91                                       |                              |  | 0.64                               |                                  |                                      | 0.59                               |                                  |                                      |  |
| <i>R</i> -squared                             |                                       | 0.92   | 0.81                                |  | 0.59                         | 0.62                                   |                                    | 0.41                             | 0.76                                 |                                    | 0.15                             | 0.46                                 |  |
| test ( $p$ -value)                            | 0.998                                 |  |                                     | 0.830                                      |                              |  | 0.744                              |                                  |                                      | 0.621                              |                                  |                                      |  |
|   | [                                     |  |                                     |  |                              | Congo                                  | Republic                           |                                  |                                      |                                    |                                  |                                      |  |
| Private credit                                | —                                     | —  | _                                   | - 0.711***                                 | -                            | -<br>1 160***                          | _                                  | —                                | _                                    | -                                  | -<br>0 702***                    | -<br>5 602***                        |  |
| Domestic credit                               | -                                     | _  | _                                   | (0.095)                                    | (0.164)                      | (0.384)                                | -                                  | -                                | _                                    | (0.239)                            | (0.136)                          | (1.167)                              |  |
| Real GDP per capita                           | -                                     | _  | _                                   | -0.014***                                  | -0.002                       | -0.005                                 | -                                  | _                                | _                                    | -0.015                             | $-0.028^{***}$                   | -0.095                               |  |
| Mean of finance<br>Threshold value            |                                       |  |                                     | (0.005) (0.009) (0.005)<br>6.60%<br>13.34% |                              |  |                                    |                                  | (0.009)                              | (0.012)<br>6.6<br>22.6             | 0%<br>59%                        |                                      |  |
| 95% confidence                                |                                       |  |                                     |  | [-8.93%                      | , 29.87%]                              |                                    |                                  |                                      |                                    | [22.31%,                         | 22.69%]                              |  |
| Observations                                  |                                       |  |                                     | 37   | 15                           | 22                                     |                                    |                                  |                                      |                                    | 29                               | 8                                    |  |
| Joint R-squared                               |                                       |  |                                     | 0.77                                       | 10                           |  |                                    |                                  |                                      | 0.69                               | _/                               | 5                                    |  |
| R-squared                                     |                                       |  |                                     |  | 0.31                         | 0.47                                   |                                    |                                  |                                      |                                    | 0.11                             | 0.84                                 |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) |                                       |  |                                     |  | 0.668                        |  |                                    |                                  |                                      |                                    | 0.995                            |                                      |  |

#### Table 6.5: Threshold estimation effects in Chad and Congo Republic

Turning to Chad, with respect to OLS estimation, private credit inhibits international trade for both exports and trade openness. However, the damaging effect is higher on trade openness relative to exports. On the nonlinearity, there is a threshold estimate of 6.09% and lies within the confidence interval of 3.13% and 8.40%. Given this threshold, it is evident that for about 62% of the observations, private credit in Chad falls below the threshold. However, below the threshold, private credit significantly reduces exports while the impact of private credit on export at higher level of private credit is insignificant. For trade openness, there is a threshold value of 4.21% where private credit threshold effect is imaginary although the coefficient is positive in both regimes. From Table 6.5, we notice that the threshold value stemming from the relationship between domestic credit and trade openness is exceedingly higher (11.46%) than that of domestic credit and exports (7.91%). This notwithstanding, the study finds similar effects of domestic credit on exports and trade openness. In particular, domestic credit significantly impedes international trade under the linear global OLS estimations with huge impact on trade openness. On the other hand, once the sample is split based on the threshold value, the impact of domestic credit on trade loses significance in both regimes. Thus, despite the data favouring a sample split, improvement in financial development when Chad's domestic financial sector is below or above the threshold does not matter for trade; although, the mean levels of finance are exceedingly higher than the threshold values. However, irrespective of the measure of finance and international trade, economic growth strongly influences international trade flows in both the linear and nonlinear models with the exception of domestic credit-trade openness nexus where the impact is negative albeit insignificant in regime 1. A closed examination of the coefficients reveals that the tradeenhancing effect of real GDP per capita is registered when financial sector development is below or above their respective thresholds.

With regard to Congo Republic, where an incomplete threshold was found involving domestic credit and the two proxies of international trade, the study reveals that domestic credit thresholds of 13.34% for exports and 22.69% for trade openness with respective confidence intervals of (-8.93% and 29.87%) and (22.31%, 22.69%). On the impact of finance on trade, the findings reveal a negative effect of domestic credit on exports. However, the impact is significant in regime 2 and not in regime 1. For trade openness, domestic credit significantly inhibits trade flows at low levels and above the threshold, the impact of domestic credit on trade is positive and statistically significant at 1%. Indeed, from Table 7.5, it is clear that the positive effect is remarkably larger than the deleterious impact at low levels. Thus, relative to earlier studies (see Kim et al., 2010a; Leibovici, 2016; Gächter & Gkrintzalis, 2017), this evidence suggests that the relationship between finance and international trade is bifurcated by the existence of a unique threshold value. Further findings however show that economic growth negatively affects exports. Nevertheless, this effect is flatly insignificant in both regime 1 and 2. With regard to growth effect on trade openness, real GDP per capita is only significant when domestic credit is below 22.69%. Thus, relative to Chad, the impact of economic growth on international trade is not robust in Congo Republic.

|   |                                    | Ľ                                    | Dependent vari                      | t variable: Exports                   |                                 |                                      |                                       | Dep  | endent variab                   | le: Trade openi                    | ness                            |                                      |
|---|------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---------------------------------|--------------------------------------|---------------------------------------|--|---------------------------------|------------------------------------|---------------------------------|--------------------------------------|
|   | Linear<br>model                    | Threshol<br>Threshold<br>Private     | d model:<br>l variable:<br>e credit | Linear<br>model                       | Threshol<br>Threshold<br>Domest | d model:<br>l variable:<br>ic credit | Linear<br>model                       | Threshol<br>Threshold<br>Private                   | d model:<br>variable:<br>credit | Linear<br>model                    | Threshol<br>Thresholo<br>Domest | d model:<br>l variable:<br>ic credit |
|   | Global OLS<br>without<br>threshold | Regime 1 $[q \le \eta]$              | Regime 2 $[q > \eta]$               | Global<br>OLS<br>without<br>threshold | Regime 1 $[q \leq \eta]$        | Regime 2 $[q > \eta]$                | Global<br>OLS<br>without<br>threshold | Regime 1 $[\boldsymbol{q} \leq \boldsymbol{\eta}]$ | Regime 2 $[q > \eta]$           | Global OLS<br>without<br>threshold | Regime 1 $[q \le \eta]$         | Regime 2 $[q > \eta]$                |
|   |                                    |                                      |                                     |                                       |                                 | Cote D                               | 'Ivoire                               |  |                                 | 1                                  |                                 |                                      |
| Private credit                          | -0.481***<br>(0.133)               | 0.019<br>(0.244)                     | -0.880<br>(0.566)                   | -                                     | -                               | -                                    | -0.931***<br>(0.222)                  | -0.924<br>(1.804)                                  | -0.657***<br>(0.098)            | -                                  | -                               | -                                    |
| Domestic credit                         | _                                  | -                                    | -                                   | -0.433***<br>(0.093)                  | -0.025<br>(0.176)               | -0.097<br>(0.385)                    | _                                     | _  | _                               | -0.875***<br>(0.145)               | 0.232<br>(0.335)                | -0.442*<br>(0.258)                   |
| Real GDP per capita                     | 0.003<br>(0.007)                   | -0.044***<br>(0.006)                 | 0.022**<br>(0.009)                  | -0.001<br>(0.005)                     | -0.043***<br>(0.007)            | 0.010**<br>(0.004)                   | 0.020<br>(0.012)                      | $-0.108^{**}$<br>(0.048)                           | 0.026<br>(0.065)                | 0.015**<br>(0.007)                 | $-0.086^{***}$<br>(0.014)       | 0.030***<br>(0.005)                  |
| Mean of finance<br>Threshold value      |                                    | 23.64%<br>22.65%<br>[16.81%, 32.06%] |                                     |                                       | 31.2<br>32.2                    | 25%<br>27%                           |                                       | 23.6<br>18.5                                       | 54%<br>50%                      |                                    | 31.2<br>28.9                    | 25%<br>97%                           |
| 95% confidence<br>interval              |                                    | [16.81%,                             | 32.06%]                             |                                       | [24.81%,                        | 32.27%]                              |                                       | [17.091%   | , 22.66%]                       |                                    | [25.38%,                        | 32.27%]                              |
| Observations<br>Joint <i>R</i> -squared | 37<br>0.75                         | 23                                   | 14                                  | 37<br>0.72                            | 23                              | 14                                   | 37<br>0.80                            | 19   | 18                              | 37<br>0.80                         | 20                              | 17                                   |
| <i>R</i> -squared<br>Heteroskedasticity |                                    | 0.74                                 | 0.30                                |                                       | 0.74                            | 0.16                                 |                                       | 0.61   | 0.61                            |                                    | 0.63                            | 0.58                                 |
| test ( <i>p</i> -value)                 |                                    | 0.522                                |                                     |                                       | 0.500                           |                                      |                                       | 0.607  |                                 |                                    | 0.957                           |                                      |
|   | 0.001                              | 0.00011                              | 0.44.4                              | 1                                     |                                 | Egypt Ara                            | b Republic                            |  | 4 4 9 9 1 1                     |                                    |                                 |                                      |
| Private credit                          | 0.024<br>(0.087)                   | -0.308**<br>(0.132)                  | 0.116<br>(0.266)                    | -                                     | —                               | —                                    | -0.110<br>(0.148)                     | $-1.013^{***}$<br>(0.262)                          | $-1.190^{**}$<br>(0.453)        | _                                  | _                               | —                                    |
| Domestic credit                         | _                                  | _                                    | _                                   | -                                     | _                               | _                                    | -                                     | _  | —                               | _                                  | -                               | _                                    |
| Real GDP per capita                     | -0.003<br>(0.002)                  | -0.005***<br>(0.002)                 | 0.034***<br>(0.005)                 | -                                     | _                               | -                                    | -0.010**<br>(0.004)                   | -0.014***<br>(0.003)                               | 0.018<br>(0.068)                | _                                  | -                               | _                                    |
| Mean of finance<br>Threshold value      |                                    | 35.0<br>39.6                         | )8%<br>59%                          | _                                     | _                               | _                                    |                                       | 35.0<br>34.1                                       | )8%<br>5%                       | _                                  | _                               | _                                    |
| 95% confidence interval                 |                                    | [34.15%,                             | 39.69%]                             |                                       |                                 |                                      |                                       | [34.15%,   | 39.69%]                         |                                    |                                 |                                      |
| Observations<br>Joint <i>R</i> -squared | 37<br>0.73                         | 26                                   | 11                                  |                                       |                                 |                                      | 37<br>0.62                            | 23   | 14                              |                                    |                                 |                                      |
| R-squared                               | 0.75                               | 0.36                                 | 0.79                                |                                       |                                 |                                      | 0.02                                  | 0.63   | 0.61                            |                                    |                                 |                                      |
| test ( $p$ -value)                      |                                    | 0.843                                |                                     |                                       |                                 |                                      |                                       | 0.938  |                                 |                                    |                                 |                                      |

#### Table 6.6: Threshold estimation effects in Cote D'Ivoire and Egypt Arab Republic

In the case of Cote D'Ivoire, we find that private credit threshold has no significant impact on exports. This finding holds irrespective of whether or not the threshold value of 22.65% is surpassed. Conversely, private credit-trade openness relationship is statistically significant when private credit threshold of 18.50% is exceeded. Here, above this inflection point, a further increase in private credit by 1% decreases trade openness by 0.657%. Interestingly, the finding on private credit-trade is consistent with domestic credit-trade nexus. Specifically, the impact of domestic credit on exports is benign in both regimes while significantly influencing trade openness only in regime 2. However, the trade-inhibiting effect of private credit is enormous and measures about 1.5 times larger than domestic credit effect. On economic growth-trade link, the study notice varying impact where real GDP per capita negatively and significantly influence international trade in regime 1 while promoting trade in regime 2. The implication is that in Cote d'Ivoire, higher economic growth positively drives the country's international trade under well-developed financial sector. Indeed, the "supply-leading" hypothesis as proposed by Patrick (1966) argues that the development of a robust financial sector positively contributes to economic growth. Thus, the well-developed financial sector is expected to spur the growth of real or non-financial sector and economic growth more generally. To the extent that per capita income is linked with demand, international trade flows should increase.

Egypt Arab Republic, where an incomplete threshold is found for only private credit and international trade, is the next focus. From Table 6.6, private credit significantly drags exports in regime 1 when finance is below the threshold of 39.69%. In this specification, exports decreases by 0.308% following a 1% rise in the level of private credit to GDP. However, surpassing this threshold renders this deleterious effect insignificant. On the other hand, private credit inhibits trade openness irrespective of the regime with a more damaging

effect in regime 2. Therefore, while higher level private credit does not matter in exports, in the case of trade openness, it shrinks the country's integration with the international markets. With regard to the economic growth, for most part, higher real per capita income does not support international trade in Egypt. It is only positive and significant on exports when private credit exceeds its threshold. Here, exports improve by 0.034% as a result of a unit-percentage increase in real GDP per capita.

|   |                       |   |  |                          | ť   |  |                          |   |  |                          |   |  |  |  |
|---|-----------------------|---|--|--------------------------|---|--|--------------------------|---|--|--------------------------|---|--|--|--|
|   |                       | Ι   | Dependent vari                         | able: Exports            |   |  |                          | Dep                                       | endent variabl                         | le: Trade oper           | iness                                     |  |  |  |
|   | Linear<br>model       | Threshol<br>Thresholo<br>Privato          | ld model:<br>1 variable:<br>e credit   | Linear<br>model          | Threshol<br>Threshol<br>Domest            | ld model:<br>1 variable:<br>ic credit  | Linear<br>model          | Thresho<br>Threshold<br>Privat            | ld model:<br>1 variable:<br>e credit   | Linear<br>model          | Threshol<br>Thresholo<br>Domest           | d model:<br>l variable:<br>ic credit   |  |  |
|   | Global OLS<br>without | Regime 1                                  | Regime 2                               | Global<br>OLS<br>without | Regime 1                                  | Regime 2                               | Global<br>OLS<br>without | Regime 1                                  | Regime 2                               | Global<br>OLS<br>without | Regime 1                                  | Regime 2                               |  |  |
|   | threshold             | $[\boldsymbol{q} \geq \boldsymbol{\eta}]$ | $[\boldsymbol{q} > \boldsymbol{\eta}]$ | threshold                | $[\boldsymbol{q} \geq \boldsymbol{\eta}]$ | $[\boldsymbol{q} > \boldsymbol{\eta}]$ | threshold                | $[\boldsymbol{q} \geq \boldsymbol{\eta}]$ | $[\boldsymbol{q} > \boldsymbol{\eta}]$ | threshold                | $[\boldsymbol{q} \geq \boldsymbol{\eta}]$ | $[\boldsymbol{q} > \boldsymbol{\eta}]$ |  |  |
|   |                       |   |  | •                        |   | Gab                                    | on                       |   |  | •                        |   |  |  |  |
| Private credit                                | -0.905***<br>(0.212)  | -2.113***<br>(0.341)                      | -2.532***<br>(0.892)                   | _                        | _   | _                                      | -0.139<br>(0.236)        | -2.817***<br>(0.346)                      | 0.095<br>(0.475)                       | _                        | _   | _                                      |  |  |
| Domestic credit                               | -                     | _   | _                                      | _                        | _   | _                                      | _                        | _   | _                                      | -                        | _   | _                                      |  |  |
| Real GDP per capita                           | 0.002*<br>(0.001)     | -0.001<br>(0.001)                         | -0.003<br>(0.014)                      | _                        | _   | -                                      | 0.005***<br>(0.001)      | 0.002*<br>(0.001)                         | 0.006***<br>(0.002)                    | _                        | _   | _                                      |  |  |
| Mean of finance<br>Threshold value            |                       | 12.9<br>15.4                              | 95%<br>48%                             | _                        | _   | _                                      |                          | 12.º<br>14.º                              | 95%<br>63%                             | _                        | _   | _                                      |  |  |
| 95% confidence                                | dence                 | [10.94%]                                  | , 15.55%]                              |                          |   |  |                          | [11.30%                                   | , 15.48%]                              |                          |   |  |  |  |
| Observations                                  | 37<br>0 59            | 28  | 9                                      |                          |   |  | 37<br>0.64               | 26  | 11                                     |                          |   |  |  |  |
| <i>R</i> -squared                             | 0.09                  | 0.58                                      | 0.60                                   |                          |   |  | 0.01                     | 0.65                                      | 0.43                                   |                          |   |  |  |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) |                       | 0.248                                     |  |                          |   |  |                          | 0.406                                     |  |                          |   |  |  |  |
|   |                       |   |  | •                        |   | Ken                                    | ya                       |   |  |                          |   |  |  |  |
| Private credit                                | -0.382**<br>(0.183)   | 0.324<br>(0.858)                          | 0.205<br>(0.188)                       | _                        | _   | _                                      | -                        | _   | -                                      | -                        | -   | _                                      |  |  |
| Domestic credit                               | _                     | _   | _                                      | _                        | _   | _                                      | —                        | _   | _                                      | —                        | —   | _                                      |  |  |
| Real GDP per capita                           | -0.020**<br>(0.008)   | -0.065*<br>(0.036)                        | -0.033***<br>(0.009)                   | _                        | _   | -                                      | _                        | _   | -                                      | _                        | _   | -                                      |  |  |
| Mean of finance<br>Threshold value            |                       | 23.<br>22.                                | 83%<br>15%                             | -                        | _   | _                                      |                          | _   | _                                      | _                        | _   | _                                      |  |  |
| 95% confidence                                |                       | [18.42%                                   | , 34.68%]                              |                          |   |  |                          |   |  |                          |   |  |  |  |
| Observations                                  | 37                    | 16  | 21                                     |                          |   |  |                          |   |  |                          |   |  |  |  |
| R-squared                                     | 0.40                  | 0.16                                      | 0.47                                   |                          |   |  |                          |   |  |                          |   |  |  |  |
| Heteroskedasticity<br>test (p-value)          |                       | 0.370                                     |  |                          |   |  |                          |   |  |                          |   |  |  |  |

#### Table 6.7: Threshold estimation effects in Gabon and Kenya

In this section, there is a discussion of the threshold effect of finance-trade nexus in Gabon and Kenya. With regard to the global OLS estimation, there is a negative and significant effect of finance on international trade when finance and trade are represented by private credit and exports, respectively. This implies that without a threshold, a unit-percentage rise in private credit reduces exports by 0.905% and 0.382% in Gabon and Kenya respectively. Since the main objective of this chapter is to examine the threshold effect, for private credit impact on exports, we find a threshold value of 15.48% for Gabon with a corresponding confidence interval of (10.94%, 15.55%). Here, both regimes 1 and 2 indicate that finance proxied by private credit dampens trade measured by exports. For instance, a 1% increase in private credit hampers exports by 2.113% in regime 1 and 2.532% in regime 2. Thus, although finance significantly inhibits trade in both regimes, the damaging effect is huge when private credit exceeds the threshold. However, evidence from the summary statistics suggests that the country's average level of private credit (12.95%) is below the threshold and at this stage, finance inhibits trade. Real GDP per capita is not robustly related to exports in both regimes as the coefficients are negative albeit insignificantly. Turning to private credittrade openness nexus, without threshold, finance has negative and insignificant effect on trade. However, below the threshold, the impact is negative and significant. This effect turns positive and insignificant in regime 2. The control variable measured by real GDP per capita has significant and positive enhancing effect for both regimes suggesting that, whether or not the study controls for nonlinearities, higher economic growth is associated with increased market integration with huge impact registered in regime 2.

In Kenya where a threshold involving private credit and exports exist, there is a threshold value of 22.15% which lies within 18.42% and 34.68%. Here, the study notices that without threshold private credit does not promote export given the negative and significant effect. In regimes 1 and 2, the impact of private credit is positive. Conversely, none of the effect is

statistically significant at conventional levels. Thus, although the data used identifies a threshold, disaggregating the sample based on the inflection point renders finance–trade nexus insignificant. Further evidence reveals that economic growth negatively and significantly affects exports. This finding is robust irrespective of the model specification. While this holds, in regime 1, the negative impact of real GDP per capita is about twice larger than that of regime 2.

|   |                            |                                  | Dependent var                       | riable: Export           | S                               |                                       |                       | Dep                            | endent variabl                       | e: Trade open            | ness                           |                                       |  |
|---|----------------------------|----------------------------------|-------------------------------------|--------------------------|---------------------------------|---------------------------------------|-----------------------|--------------------------------|--------------------------------------|--------------------------|--------------------------------|---------------------------------------|--|
|   | Linear<br>model            | Threshol<br>Thresholo<br>Private | d model:<br>1 variable:<br>e credit | Linear<br>model          | Threshol<br>Thresholo<br>Domest | ld model:<br>1 variable:<br>ic credit | Linear<br>model       | Threshol<br>Threshol<br>Privat | ld model:<br>1 variable:<br>e credit | Linear<br>model          | Threshol<br>Threshol<br>Domest | d model:<br>1 variable:<br>tic credit |  |
|   | Global<br>OLS<br>without   | Regime 1 $[a < n]$               | Regime 2 $[a > n]$                  | Global<br>OLS<br>without | Regime 1 $[a < n]$              | Regime 2 $[a > n]$                    | Global OLS<br>without | Regime 1 $[a < n]$             | Regime 2 $[a > n]$                   | Global<br>OLS<br>without | Regime 1 $[a < n]$             | Regime 2 $[a > n]$                    |  |
|   | threshold                  | $[\mathbf{q} \ge \mathbf{q}]$    | [9 - 1]]                            | threshold                | $[\mathbf{q} \ge \mathbf{q}]$   | [9 - 1]]                              | threshold             | $[\mathbf{q} - \mathbf{\eta}]$ | [9 - 1]]                             | threshold                | $[\mathbf{q} - \mathbf{q}]$    | [9 > 1]]                              |  |
|   |                            |                                  |                                     |                          |                                 | Ma                                    | lawi                  |                                |                                      |                          |                                |                                       |  |
| Private credit                                | 0.159<br>(0.158)           | 0.504**<br>(0.237)               | -0.637*<br>(0.341)                  | _                        | _                               | _                                     | _                     | _                              | _                                    | _                        | _                              | _                                     |  |
| Domestic credit                               | _                          | -                                | _                                   | 0.014<br>(0.069)         | 0.408<br>(0.260)                | 0.155<br>(0.112)                      | _                     | _                              | _                                    | -0.143<br>(0.153)        | -0.226<br>(0.262)              | -3.187***<br>(0.363)                  |  |
| Real GDP per capita                           | 0.039**<br>(0.017)         | 0.058***<br>(0.015)              | -0.021<br>(0.015)                   | 0.069***<br>(0.017)      | 0.073***<br>(0.014)             | -0.001<br>(0.017)                     | -                     | _                              | _                                    | 0.050<br>(0.044)         | 0.113***<br>(0.027)            | -0.362***<br>(0.091)                  |  |
| Mean of finance<br>Threshold value            |                            | 10.3<br>12.4                     | 32%<br>45%                          |                          | 21.9<br>20.9                    | 91%<br>96%                            | -                     | _                              | _                                    |                          | 21.9<br>25.9                   | €3%                                   |  |
| 95% confidence<br>interval                    |                            | [4.56%,                          | 13.83%]                             |                          | [12.95,                         | 22.31%]                               |                       |                                |                                      |                          | [12.53%                        | , 26.69%]                             |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.39                 | 27                               | 10                                  | 37<br>0.44               | 19                              | 18                                    |                       |                                |                                      | 37<br>0.41               | 26                             | 11                                    |  |
| <i>R</i> -squared<br>Heteroskedasticity       |                            | 0.40                             | 0.33                                |                          | 0.50                            | 0.9                                   |                       |                                |                                      |                          | 0.31                           | 0.56                                  |  |
| test (p-value)                                |                            | 0.459                            |                                     |                          | 0.238                           |                                       |                       |                                |                                      |                          | 0.611                          |                                       |  |
|   |                            |                                  |                                     |                          |                                 | Ν                                     | Iali                  |                                |                                      |                          |                                |                                       |  |
| Private credit                                | -0.225**<br>(0.086)        | -0.525*<br>(0.264)               | -0.463***<br>(0.094)                |                          |                                 |                                       | -0.568***<br>(0.136)  | -2.457***<br>(0.511)           | -0.751***<br>(0.150)                 | _                        | _                              | -                                     |  |
| Domestic credit                               | -                          | -                                | _                                   | -0.094<br>(0.049)        | 0.197<br>(0.132)                | 0.003<br>(0.059)                      | _                     | _                              | _                                    | _                        | -                              | -                                     |  |
| Real GDP per capita                           | 0.035***<br>(0.003)        | $0.048^{***}$<br>(0.008)         | 0.031***<br>(0.004)                 | 0.031***<br>(0.005)      | 0.036***<br>(0.005)             | 0.024***<br>(0.004)                   | 0.032***<br>(0.007)   | 0.066***<br>(0.012)            | 0.026***<br>(0.006)                  | _                        | -                              | -                                     |  |
| Mean of finance<br>Threshold value            |                            | 14.0<br>12.3                     | 57%<br>35%                          |                          | 17.3<br>20.0                    | 33%<br>58%                            |                       | 14.<br>12.                     | 57%<br>11%                           |                          |                                |                                       |  |
| 95% confidence interval                       | [11.94%, 12.35%]           |                                  | , 12.35%]                           |                          | [12.60%,                        | , 25.10%]                             |                       | [11.94%                        | , 12.73%]                            | -                        | -                              | -                                     |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.76                 | 12                               | 25                                  | 37<br>0.72               | 28                              | 9                                     | 37<br>0.63            | 10                             | 27                                   |                          |                                |                                       |  |
| R-squared                                     |                            | 0.79                             | 0.73                                |                          | 0.61                            | 0.88                                  |                       | 0.79                           | 0.54                                 | ļ                        |                                |                                       |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) | 0.76<br>0.79 0.73<br>0.513 |                                  |                                     |                          | 0.383                           |                                       |                       | 0.992                          |                                      |                          |                                |                                       |  |

#### Table 6.8: Threshold estimation effects in Malawi and Mali

With regard to Malawi, this study finds a positive and insignificant effect of private credit on exports when the linear model is specified. There is a private credit threshold value of 12.45%. In regime 1 where private credit is below the threshold, changes in private credit positively and significantly influences trade. On the other hand, a percentage increase in finance hampers trade by about 0.637% when private credit is above the threshold. The average private credit over the sample period suggests that Malawi's financial development is below the threshold and suggesting that the current financial markets support exports. However, domestic credit threshold effect on export is positive and flatly insignificant at conventional levels. Meanwhile, although the average domestic credit exceeds the threshold of 20.96%, changes in domestic credit does not matter in export volumes. Regarding domestic credit-trade openness nexus, different pattern is observed where finance harms trade especially when domestic credit is above the threshold. Specifically, relative to regime 1, in regime 2, a 1% increases in domestic credit significantly reduces trade by 3.187%. Thus, financial development plays a non-negligible role. Indeed, while many countries in Africa have experienced substantial financial sector development in the last few decades and contributing to an increase in trade, as Malawi approaches their estimated threshold, the support provided by further financial deepening for trade increasingly wanes. This evidence provides partial support for Kim et al., (2010b) whose threshold analysis suggests a nonlinear long run relationship where trade decreases with financial development.

Real GDP per capita, on the other hand, has varying effects of trade openness. For instance, in regime 1, a unit–percentage increase in real GDP per capita improves trade by 0.113% while reducing trade openness by 0.362% in regime 2.

Turning to Mali where there are thresholds for all except for domestic credit–trade openness nexus, the threshold estimate of 12.35% for private credit and 20.68% for domestic credit and

117

exports, 12.11% for private credit-trade openness nexus. Private credit does not promote exports irrespective of the model specification with painful consequence in regime 1 relative to regime 2. Similar effect is also observed in private credit-trade openness nexus. However, the negative effect on trade openness in regime 1 is almost five times larger than the impact on exports. To the extent that the average private credit is above the inflection points means that Mali is not heavily affected by the negative effect of finance. Domestic credit is however insignificantly related to trade although the coefficients are positive in both regimes. Interestingly, real GDP per capita enhances trade at 1% level of significance throughout the estimations. With the economic growth nexus, even though in all the regimes, there is a positive effect, the positive effect diminishes in regimes 2. The impact of economic growth is not regime–specific where real GDP per capita promote trade when private and domestic credits are below (or above) the threshold. However, for both private and domestic credit thresholds, the trade–enhancing effect of economic growth is consistently huge when finance is below the thresholds.

|   |                  |                     | Dependent var | riable: Export   | S                   |                  |           | Dep            | endent variabl | le: Trade oper | iness          |              |
|---|------------------|---------------------|---------------|------------------|---------------------|------------------|-----------|----------------|----------------|----------------|----------------|--------------|
|   | Linear           | Threshol            | ld model:     | Linoar           | Threshol            | d model:         | Linear    | Threshol       | d model:       | Linoar         | Threshol       | d model:     |
|   | model            | Threshold           | l variable:   | model            | Threshold           | l variable:      | model     | Threshold      | l variable:    | model          | Threshold      | l variable:  |
|   | moder            | Private             | e credit      | model            | Domest              | ic credit        | model     | Private        | e credit       | model          | Domest         | ic credit    |
|   | Global           |                     |               | Global           |                     |                  | Global    |                |                | Global         |                |              |
|   | OLS              | Regime I            | Regime 2      | OLS              | Regime I            | Regime 2         | OLS       | Regime I       | Regime 2       | OLS            | Regime I       | Regime 2     |
|   | without          | $[q \le \eta]$      | $[q > \eta]$  | without          | $[q \le \eta]$      | $[q > \eta]$     | without   | $[q \le \eta]$ | $[q > \eta]$   | without        | $[q \le \eta]$ | $[q > \eta]$ |
|   | threshold        |                     |               | threshold        |                     |                  | threshold |                |                | threshold      |                |              |
| <b>D</b> 1  |                  |                     |               |                  |                     | Mor              | occo      |                |                |                |                |              |
| Private credit  | —                | _                   | _             | -                | -                   | _<br>0.104/white | _         | _              | _              |                | -              | -            |
| Domestic credit   | _                | _                   | _             | 0.066*           | -0.298              | -0.124***        | _         | _              | _              | 0.298**        | 0.135          | 0.072        |
|   |                  |                     |               | (0.038)          | (0.387)             | (0.043)          |           |                |                | (0.121)        | (0.267)        | (0.105)      |
| Real GDP per capita   | _                | _                   | _             | 0.005***         | -0.005              | 0.012***         | _         | _              | _              | 0.006          | -0.013***      | 0.020***     |
|   |                  |                     |               | (0.001)          | (0.010)             | (0.002)          |           |                |                | 0.006          | (0.004)        | (0.005)      |
| Mean of finance   |                  |                     |               |                  | 65.                 | 19%              |           |                |                |                | 65.1           | 19%          |
| Threshold value   |                  |                     |               |                  | 65.2                | 23%              |           |                |                |                | 50.0           | 02%          |
| 95% confidence  |                  |                     |               |                  | [46.97%.            | 94.02%]          |           |                |                |                | [43.46%]       | 77.31%]      |
| interval  |                  |                     |               | 27               | 10                  | 10               |           |                |                | 27             | 17             | 20           |
| Observations  |                  |                     |               | 3/               | 19                  | 18               |           |                |                | 3/             | 17             | 20           |
| Joint R-squared   |                  |                     |               | 0.87             | 0.45                | 0.76             |           |                |                | 0.88           | 0.25           | 0.01         |
| <i>R</i> -squared   |                  |                     |               |                  | 0.45                | 0.76             |           |                |                |                | 0.35           | 0.81         |
| Heteroskedasticity  |                  |                     |               |                  | 0.818               |                  |           |                |                |                | 0.364          |              |
| test ( <i>p</i> -value)   |                  |                     |               |                  |                     | D                | J         |                |                |                |                |              |
|   | 0.112            | 0.142               | 0.020***      |                  |                     | KWa              | inda      |                |                |                |                |              |
| Private credit  | -0.112           | -0.142              | 0.239***      | _                | _                   | _                | _         | _              | _              | _              | _              | _            |
|   | (0.147)          | (0.229)             | (0.094)       | 0.222**          | 0 451***            | 0 202***         |           |                |                |                |                |              |
| Domestic credit   | _                | _                   | _             | $-0.233^{**}$    | -0.451***           | $0.382^{***}$    | _         | _              | _              | _              | _              | _            |
|   | 0.025***         | 0.020***            | 0.001         | (0.110)          | (0.097)             | (0.041)          |           |                |                |                |                |              |
| Real GDP per capita   | $(0.025^{****})$ | $0.028^{****}$      | (0.001)       | $(0.021^{****})$ | $(0.021^{****})$    | $0.002^{*}$      | -         | _              | _              | -              | _              | -            |
| Maan of finance   | (0.003)          | (0.010)             | (0.003)       | (0.002)          | (0.002)             | (0.001)          |           |                |                |                |                |              |
| Thread of finance   |                  | 10.3                | 54%<br>55%    |                  | 11.0                | 50%<br>740/      |           |                |                |                |                |              |
| 1 meshold value   |                  | 11.0                | J <i>3</i> %  |                  | 14.                 | /4%              |           |                |                |                |                |              |
| 95% confidence  | [6.09%, 16.00%]  |                     |               |                  | [12.47%,            | , 17.07%]        |           |                |                |                |                |              |
| Observations  | 27               | 24                  | 12            | 27               | 20                  | 0                |           |                |                |                |                |              |
| Loipt P squared   | 0.60             | 24                  | 15            | 0.84             | 29                  | 0                |           |                |                |                |                |              |
| R-squared   | 0.09             | 0.34                | 0.48          | 0.04             | 0.77                | 0.96             |           |                |                |                |                |              |
| Heteroskedasticity  | 0.34 0.48        |                     |               |                  | 0.77                | 0.90             |           |                |                |                |                |              |
| test ( <i>p</i> -value)   |                  | 0.274               |               |                  | 0.384               |                  |           |                |                |                |                |              |
| Observations<br>Joint <i>R</i> -squared<br><i>R</i> -squared<br>Heteroskedasticity<br>test ( <i>p</i> -value) | 37<br>0.69       | 24<br>0.34<br>0.274 | 13<br>0.48    | 37<br>0.84       | 29<br>0.77<br>0.384 | 8<br>0.96        |           |                |                |                |                |              |

#### Table 6.9: Threshold estimation effects in Morocco and Rwanda

We turn to Morocco, where an incomplete threshold is found for only domestic credit and international trade. From Table 6.9, domestic credit drags exports in regimes 1 and 2 when finance threshold is 65.23%. In this specification, effect in regime 1 is insignificant. Above the threshold, a unit–percentage rise in domestic credit significantly decreases exports by 0.124%. However, the average level of domestic credit is slightly below the threshold. On the other hand, while domestic credit appears to enhance trade openness, its effect is insignificant once there is a control for nonlinearities. With regard to the economic growth, higher real per capita income does not support international trade flows in regimes 1 and 2. However, above the threshold, higher economic growth is associated with higher trade flows. To the extent that average domestic credit is higher than domestic credit threshold of 50.02% suggests that Morocco is operating in high regime financial sector development in relation to domestic credit–trade openness nexus.

In Rwanda, export is insignificantly related to private credit in regime 1 but once the threshold of 11.05% is exceeded, private credit positively and significantly affects exports. For domestic credit and exports, there is an inflection point of 14.74% where 29 out of the 37 observations fall below. The study observes different level of effects of finance on exports. Specifically, while domestic credit significantly inhibits exports at its low levels, too much finance is export–enhancing where a unit–percentage rise in domestic credit spurs trade by 0.382% in regime 2. Thus, the same measure of finance yields different effects on trade given the prevailing level of domestic financial sector development. Indeed, the evidence shows that, for both financial development thresholds, Rwanda's financial sector development trails behind the optimal level and therefore does not enjoy the trade benefits associated with well–developed financial sector. For most part, real GDP per capita significantly increases international trade. This effect is invariant of the model specification. In particular, relying on

domestic credit as the mediating variable, economic growth positively influences exports in both regimes and marginally significant in regime 2. On the other hand, economic growth– trade link is not significant in regime 2 when private credit is used as the threshold variable.

|                         |           |                 |               | 0                     |                 |              | 1         |                   |                |               |                 |              |  |
|-------------------------|-----------|-----------------|---------------|-----------------------|-----------------|--------------|-----------|-------------------|----------------|---------------|-----------------|--------------|--|
|                         |           |                 | Dependent var | ent variable: Exports |                 |              |           | Dep               | endent variabl | e: Trade oper | iness           |              |  |
|                         | Lincor    | Threshol        | d model:      | Linoar                | Threshol        | d model:     | Linear    | Threshol          | d model:       | Linear        | Threshol        | d model:     |  |
|                         | model     | Threshold       | l variable:   | model                 | Threshold       | l variable:  | model     | Threshold         | l variable:    | model         | Threshold       | variable:    |  |
|                         | model     | Private         | e credit      | model                 | Domest          | ic credit    | model     | Private           | e credit       | model         | Domesti         | c credit     |  |
|                         | Global    |                 |               | Global                |                 |              | Global    |                   |                | Global        |                 |              |  |
|                         | OLS       | Regime 1        | Regime 2      | OLS                   | Regime 1        | Regime 2     | OLS       | Regime 1          | Regime 2       | OLS           | Regime 1        | Regime 2     |  |
|                         | without   | $[q \leq \eta]$ | $[q > \eta]$  | without               | $[q \leq \eta]$ | $[q > \eta]$ | without   | $[q \leq \eta]$   | $[q > \eta]$   | without       | $[q \leq \eta]$ | $[q > \eta]$ |  |
|                         | threshold |                 | -1 /-         | threshold             |                 | -1 /-        | threshold | - 1               | -1 /-          | threshold     | -1 /-           | -1 /-        |  |
|                         |           |                 |               |                       |                 | Sen          | egal      |                   |                |               |                 |              |  |
| Drivete credit          | 0.021     | -0.430***       | 0.010         |                       |                 |              | 0.172     | -0.935***         | 0.170          |               |                 |              |  |
| Filvate credit          | (0.096)   | (0.066)         | (0.373)       | _                     | —               | —            | (0.244)   | (0.142)           | (0.987)        | _             | _               | _            |  |
| Domostio andit          |           |                 |               | 0.045                 | 0.145           | 0.502***     |           |                   |                | 0.134         | -0.451***       | 2.819**      |  |
| Domestic credit         | —         | —               | _             | (0.072)               | (0.137)         | (0.116)      | _         | —                 | _              | (0.194)       | (0.115)         | (1.357)      |  |
|                         | 0.001     | 0.003           | -0.012        | 0.001                 | -0.018 ***      | 0.016***     | 0.055***  | 0.077***          | -0.005         | 0.058***      | 0.083***        | -0.009       |  |
| Real GDP per capita     | (0.008)   | (0.006)         | (0.011)       | (0.007)               | (0.005)         | (0.005)      | (0.019)   | (0.015)           | (0.026)        | (0.016)       | (0.014)         | (0.024)      |  |
| Mean of finance         |           | 24.6            | 52%           |                       | 30.6            | 59%          |           | 24.6              | 52%            |               | 30.6            | 9%           |  |
| Threshold value         |           | 29.1            | 10%           |                       | 26.0            | )1%          |           | 29.1              | 0%             |               | 40.7            | 6%           |  |
| 95% confidence          |           | F10 750/        | 20.020/1      |                       | FO 4 570/       | 40.760/1     |           | [ <b>0</b> 2 (00/ | 20.920/1       |               | 120 200/        | 41 (40/1     |  |
| interval                |           | [19./5%,        | 29.82%]       |                       | [24.57%,        | 40.76%]      |           | [23.68%,          | 29.82%]        |               | [39.30%,        | 41.64%]      |  |
| Observations            | 37        | 26              | 11            | 37                    | 15              | 22           | 37        | 26                | 11             | 37            | 31              | 6            |  |
| Joint R-squared         | 0.58      |                 |               | 0.56                  |                 |              | 0.70      |                   |                | 0.70          |                 |              |  |
| R-squared               |           | 0.64            | 0.10          |                       | 0.54            | 0.54         |           | 0.67              | 0.009          |               | 0.60            | 0.46         |  |
| Heteroskedasticity      |           | 0.110           |               |                       | 0.004           |              |           | 0.7/7             |                |               | 0.040           |              |  |
| test ( <i>p</i> -value) |           | 0.110           |               |                       | 0.204           |              |           | 0.767             |                |               | 0.840           |              |  |
| •                       |           |                 |               | •                     |                 | Suc          | lan       |                   |                | •             |                 |              |  |
| D: / 1'/                | 0.519***  | 0.165           | -1.938        |                       |                 |              | 1.326***  | 0.140             | 3.291**        |               |                 |              |  |
| Private credit          | (0.155)   | (0.275)         | (2.800)       | —                     | -               | -            | (0.281)   | (0.290)           | (1.322)        | _             | -               | -            |  |
| Domestic credit         | _         | _               | _             | _                     | _               | _            | . ,       | . ,               | . ,            |               |                 |              |  |
|                         | 0.005**   | 0.004*          | 0.001         |                       |                 |              | 0.005     | 0.059***          | 0.007          |               |                 |              |  |
| Real GDP per capita     | (0.002)   | (0.002)         | (0.022)       |                       |                 |              | (0.003)   | (0.004)           | (0.005)        | —             | _               | -            |  |
| Mean of finance         |           | 7.7             | 7%            |                       |                 |              |           | 7.7               | 7%             |               |                 |              |  |
| Threshold value         |           | 11.0            | )8%           | _                     | _               | _            |           | 6.9               | 7%             |               |                 |              |  |
| 95% confidence          |           | F.4. #0.44      | 11.00013      |                       |                 |              |           |                   |                |               |                 |              |  |
| interval                |           | [4.58%,         | 11.08%]       |                       |                 |              |           | [6.07%,           | 6.97%]         |               |                 |              |  |
| Observations            | 37        | 27              | 10            |                       |                 |              | 37        | 16                | 21             |               |                 |              |  |
| Joint R-squared         | 0.54      |                 | -             |                       |                 |              | 0.59      | -                 |                |               |                 |              |  |
| R-squared               |           | 0.16            | 0.84          |                       |                 |              |           | 0.83              | 0.32           |               |                 |              |  |
| Heteroskedasticity      |           | 0 5 50          |               |                       |                 |              |           | 0.001             |                |               |                 |              |  |
| test ( <i>p</i> -value) |           | 0.759           |               |                       |                 |              |           | 0.891             |                |               |                 |              |  |

### Table 6.10: Threshold estimation effects in Senegal and Sudan

Turning to Senegal, the findings based on the OLS reveal that, private credit does not significantly enhance international trade for both exports and trade openness. In regime 1 for both cases, private credit significantly hampers trade with higher effect on trade openness relative to exports given their respective coefficients. In regime 2, none of the impact of private credit on international trade is significant. A juxtaposition of the average private credit against the threshold value of 29.10% shows that Senegal's private credit is below the inflection point where financial development is not export–enhancing. Similarly, for private credit-trade openness nexus, the mean level of private credit is below the threshold and in this regime, finance negatively and significantly inhibits cross-border trade. Turning to domestic credit-trade openness link, the threshold of domestic credit is less than the mean denoting a high regime zone where a 1% increase in domestic credit significantly promotes exports by 0.502%. With regard to domestic credit-trade openness nexus, finance significantly harms trade at low levels while promoting international trade integration at high levels. It is evident that the positive effect of finance well exceeds the negative effect. What is vivid from the finding is that for both measures of finance, Senegal's trade improves if private and domestic credits are developed well above the thresholds.

While the intermediate impact is likely to be negative, as resources become redundant in areas of comparative disadvantage and low production scale, their eventual reallocation into areas of comparative advantage will increase international trade. This finding is inconsistent with Kim et al., (2010b) who find that the long–run coefficients of finance are positive and significant for low– and medium–financially developed countries and insignificant for well– developed financial sectors. However, for both indicators of finance and trade nexus, the country's average level of finance is below all turning points except domestic credit and exports linkage. Further evidence suggests that, economic growth positively influences trade openness only at low levels of finance.

With regard to Sudan, where an incomplete threshold was found for private credit and the two proxies of international trade, we find private credit threshold of 11.08% for exports and 6.97% for trade openness with respective confidence intervals of (4.58%, 11.08%) and (6.07%, 6.97%). By disaggregating sample according to the thresholds, the study finds no evidence on the impact of finance on exports. For trade openness, the impact of domestic credit is positive and significant in regime 2 suggesting that finance has beneficial effect on international trade only under well–developed domestic financial sectors. Arguably, the current mean of finance appears to exceed the threshold in finance–trade openness nexus but not finance–export relationship. Economic growth effect is disproportionate when there is sample splitting. Specifically, for both exports and trade openness, real GDP per capita improves trade only in regime 1. In regime 2 however, the impact is imaginary.

|   |                          |                                   | Dependent var                   | riable: Export           | s                               |                                    | Dependent variable: Trade openness |                                   |                                     |                          |                                 |                                      |  |
|---|--------------------------|-----------------------------------|---------------------------------|--------------------------|---------------------------------|------------------------------------|------------------------------------|-----------------------------------|-------------------------------------|--------------------------|---------------------------------|--------------------------------------|--|
|   | Linear<br>model          | Threshold<br>Threshold<br>Private | d model:<br>variable:<br>credit | Linear<br>model          | Threshol<br>Threshold<br>Domest | d model:<br>variable:<br>ic credit | Linear<br>model                    | Threshold<br>Threshold<br>Private | d model:<br>l variable:<br>e credit | Linear<br>model          | Threshol<br>Threshold<br>Domest | d model:<br>l variable:<br>ic credit |  |
|   | Global<br>OLS<br>without | Regime 1 $[a < n]$                | Regime 2 $[a > n]$              | Global<br>OLS<br>without | Regime 1 $[a < n]$              | Regime 2 $[a > n]$                 | Global<br>OLS<br>without           | Regime 1 $[a < n]$                | Regime 2 $[a > n]$                  | Global<br>OLS<br>without | Regime 1 $[a < n]$              | Regime 2 $[a > n]$                   |  |
|   | threshold                | [ <b>4</b> – <b>1</b> ]           | [9 > 1]]                        | threshold                | [ <b>9</b> - <b>1</b> ]         | [9 > 1]]                           | threshold                          | 19 - 11                           | [4 > 1]                             | threshold                | [ <b>4</b> – <b>1</b> ]         | [4 > 1]                              |  |
|   |                          |                                   |                                 |                          |                                 | To                                 | go                                 |                                   |                                     |                          |                                 |                                      |  |
| Private credit                                | 0.262*<br>(0.151)        | 0.852***<br>(0.303)               | 0.324*<br>(0.191)               | _                        | _                               | _                                  | 0.685*<br>(0.373)                  | 2.474***<br>(0.735)               | 1.272***<br>(0.412)                 | _                        | _                               | _                                    |  |
| Domestic credit                               | _                        | -                                 | _                               | 0.315**<br>(0.129)       | $-1.864^{***}$<br>(0.551)       | 0.385*<br>(0.195)                  | _                                  | _                                 | _                                   | 0.918***<br>(0.280)      | 2.978*<br>(1.683)               | 1.752***<br>(0.251)                  |  |
| Real GDP per capita                           | 0.066***<br>(0.019)      | -0.195***<br>(0.039)              | 0.090***<br>(0.017)             | 0.066***<br>(0.016)      | 0.067<br>(0.040)                | 0.082***<br>(0.015)                | 0.095*<br>(0.053)                  | -0.485***<br>(0.107)              | 0.147***<br>(0.050)                 | 0.092**<br>(0.044)       | -0.046<br>(0.097)               | 0.123***<br>(0.035)                  |  |
| Mean of finance<br>Threshold value            |                          | 21.9<br>17.7                      | 98%<br>17%                      |                          | 25.8<br>22.9                    | 34%<br>95%                         |                                    | 21.9<br>17.7                      | 98%<br>77%                          |                          | 25.8<br>19.7                    | 34%<br>79%                           |  |
| 95% confidence<br>interval                    |                          | [17.34%,                          | 20.08%]                         |                          | [19.79%,                        | 23.09%]                            |                                    | [13.26%,                          | 29.57%]                             |                          | [18.07%,                        | 22.96%]                              |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.62               | 10                                | 27                              | 37                       | 15<br>0.60                      | 22                                 | 37<br>0.56                         | 10                                | 27                                  | 37<br>0.68               | 8                               | 29                                   |  |
| <i>R</i> -squared<br>Heteroskedasticity       |                          | 0.81                              | 0.40                            |                          | 0.43                            | 0.57                               |                                    | 0.78                              | 0.50                                |                          | 0.16                            | 0.71                                 |  |
| test ( $p$ -value)                            |                          | 0.202                             |                                 |                          | 0.970                           |                                    |                                    | 0.781                             |                                     |                          | 0.845                           |                                      |  |
|   |                          |                                   |                                 |                          |                                 | Tun                                | isia                               |                                   |                                     | •                        |                                 |                                      |  |
| Private credit                                | -0.226**<br>(0.102)      | -0.385***<br>(0.119)              | -1.177***<br>(0.401)            | -                        | -                               | _                                  | -0.153<br>(0.203)                  | -0.605**<br>(0.258)               | -1.817**<br>(0.803)                 | _                        | _                               | -                                    |  |
| Domestic credit                               | _                        | _                                 | _                               | —                        | _                               | _                                  | -                                  | _                                 | _                                   | -0.182<br>(0.172)        | -0.362<br>(0.355)               | -1.309***<br>(0.318)                 |  |
| Real GDP per capita                           | 0.006***<br>(0.001)      | 0.006***<br>(0.001)               | 0.009***<br>(0.002)             | _                        | _                               | _                                  | 0.010***<br>(0.002)                | 0.009***<br>(0.002)               | 0.017***<br>(0.004)                 | 0.010***<br>(0.001)      | 0.009***<br>(0.003)             | 0.018***<br>(0.002)                  |  |
| Mean of finance<br>Threshold value            |                          | 69.6<br>66.8                      | 53%<br>50%                      |                          |                                 |                                    |                                    | 63.0<br>66.8                      | 07%<br>30%                          |                          | 69.0<br>68.4                    | 53%<br>14%                           |  |
| 95% confidence interval                       |                          | [62.52%,                          | 76.26%]                         |                          |                                 |                                    |                                    | [55.08%,                          | 76.26%]                             |                          | [62.18%,                        | 83.16%]                              |  |
| Observations<br>Joint <i>R</i> -squared       | 37<br>0.65               | 26                                | 11                              |                          |                                 |                                    | 37<br>0.62                         | 26                                | 11                                  | 37<br>0.64               | 23                              | 14                                   |  |
| <i>R</i> -squared                             |                          | 0.59                              | 0.68                            |                          |                                 |                                    |                                    | 0.44                              | 0.73                                |                          | 0.33                            | 0.87                                 |  |
| Heteroskedasticity<br>test ( <i>p</i> -value) |                          | 0.989                             |                                 |                          |                                 |                                    |                                    | 0.658                             |                                     |                          | 0.225                           |                                      |  |

# Table 6.11: Threshold estimation effects in Togo and Tunisia

Paying attention to Togo, the findings reveal that, for the global OLS, private credit enhances international trade for both exports and trade openness. In regime 1 for both cases, private credit has trade-enhancing effect and this remain positive irrespective of the measure of finance and trade. However, in each of these cases, the impact of finance on trade openness is large relative to its impact on exports. More so, higher trade effect of finance is registered when both proxies are below their respective thresholds. Here, the impact of private credit on openness is about three times larger than the effect of private credit on exports. Similar pattern is observed in regime 2. From Table 6.11, it is evident that domestic credit significantly influences international trade. While the impact is robustly positive on trade openness, for exports, a unit-percentage increase in domestic credit dampens exports by 1.864% when finance is below the threshold. However, Togo's mean domestic credit of 25.84% is above the threshold of 22.95%. The implication is that, although the country's financial sector is relatively under-developed, with reference to their unique threshold, domestic credit is high enough to exact a positive effect on exports. Thus, knowing the right levels of finance is crucial in spurring international trade given the varying effects both in terms of direction and magnitude. On the link between economic growth and trade, the results show that real GDP per capita inhibits trade when finance is below the threshold. In regimes 2, however, the impact of economic growth is positive and significant.

With regard to Tunisia, where an incomplete threshold is found for (i) private credit–exports, (ii) private credit–trade openness and (iii) domestic credit–trade openness nexus, the study finds private credit thresholds to be 66.80% for both exports and trade openness with respective confidence intervals of (62.52%, 76.26%) and (55.08%, 76.26%), respectively. There is no threshold for domestic credit and exports. However, the threshold for domestic credit–trade openness is 68.44% for trade openness with a corresponding interval of (62.18%, 83.16%). This study further reveals that irrespective of the measure of finance, domestic level

of financial sector development has debilitating effect on trade. The negative impact is exacerbated when private credit is above the threshold. Indeed, from Table 6.11, the foregoing analysis shows that the negative effect is remarkably larger, especially at higher level of finance. This evidence suggests that in the case of Tunisia, international trade flow does not improve with a well–developed domestic financial sector. At the current stage, the country's private credit threshold is exceeded, significantly inhibiting exports. A conjectural explanation for this negative finance effect on trade can be drawn from Trefler (1995). Indeed, following from Trefler (1995), the financial under–development and market frictions in financially less developed economies reallocate resources across sectors and away from exporting firms in a way that lowers international trade and this can explain why countries like Tunisia trade less than what the traditional Ricardian or Heckscher–Ohlin models project.

However, in relation to trade openness, domestic credit is below the optimal level and thus impact of finance on trade openness is less negative. More so, the country's real GDP per capita is an important factor in trade promotion given their positive and significant effects in all the trade equations. Conclusively, economic growth–trade nexus in Tunisia does not depend on the country's level of financial sector development.

We summarize the performance of countries' financial development against the identified threshold in financial development-trade link. From Figure 6.1 where the level of financial development threshold in finance-exports nexus is presented, the study shows that average values of private credit are below the identified thresholds in 10 countries while seven countries have private credit exceeding the threshold. However, for domestic credit-exports association, eight (seven) countries have domestic credit above (below) their respective thresholds.

127


Figure 6.1: Average values of finance against threshold in finance–exports

However, from Figure 6.2 where there is a plot of finance–trade openness linkage, it can be observed that for most part, the levels of financial development in the countries are above their threshold levels. Thus majority of countries are operating at relatively high levels where the mean of finance exceeds the identified threshold.



#### Figure 6.2: Average values of finance against threshold in finance-trade openness

Indeed, given Tables 6.2 to 6.11, the study summarizes the key direction of effect in the threshold analysis in Figures 6.3 and 6.4. Here, the concentration is only on those effects which are significant at conventional levels and not the magnitude of effect.



Figure 6.3: Financial development threshold and export effects

Beginning with private credit and exports, from Figure 6.3, it can be observed that when the domestic level of financial development is below the threshold, for most part, financial sector development inhibits exports. Specifically, our findings reveal 10 incidences where finance decreases international trade at low levels and only improves trade at only two incidences. With regard to private credit–exports nexus at high level of finance, it is evident that there is a similar negative effect of finance on trade. For majority of the cases at high level of domestic financial sector, financial sector development negatively and significantly affects exports. Turning to domestic credit and exports link, the evidence also suggests that financial development considerably lowers international trade. Interestingly, above the threshold, the impact of finance on trade is ambiguous given the homogenous incidence of effect.



Figure 6.4: Financial development threshold and trade openness

On private credit and trade openness relationship, from Figure 6.4, the study finds that whether financial development is below or above their respective thresholds, private credit does not appear to support trade. At low level of private credit, the negative incidence is enormous (eight incidences) relative to the negative link between private credit and trade openness at higher level of finance (five incidences). This finding is akin to domestic credit threshold effect on trade openness where financial development, for most part, negatively affects trade at low level of finance (four incidences). Interestingly, the finding on domestic credit–trade openness nexus at higher level of finance is consistent with domestic credit–exports link where the impact of financial development on international trade is homogenous given the equal number of positive and negative incidences.

Indeed, the figures above leads to a unique conclusion that, domestic level of financial sector development largely inhibits international trade irrespective of the indicator of finance and

trade. Thus, the evidence provided in this study suggests that Africa's nascent financial markets are not developed enough to promote international trade flows.

#### 6.3 Conclusion and Policy Implications

Undoubtedly, the relationship between financial sector development and international trade has well received much attention in both the theoretical and empirical literature in the past few decades. Indeed, recent theoretical studies have documented a strong positive link between the level of financial development and international trade at both the firm and industry levels. However, empirical evidence is mixed. In addition, examination of nonlinearities in finance–trade nexus has not been rigorous and findings emanating from such studies are not instructive. This study re–examined the threshold effects of finance on trade by positing that whether finance promotes or inhibits trade depends on the level of domestic financial sector development. Relying on annual time series data from 46 countries in Africa over the period 1980–2016, the study re–investigated the threshold effects of finance by employing a sample splitting and threshold estimation approach.

This study finds evidence of threshold effects for a number of the countries suggesting that the precise impact of financial development on international trade is threshold–specific given the various indicators of finance. The main finding is that, whether finance promotes or hampers trade depends on the optimal level of finance, where in some countries, finance lowers or improves trade in under–developed financial sectors and where the domestic level of financial sector development falls below the threshold. In other countries, the impact of finance is either positive or negative in well–developed financial sectors where the domestic level of financial sector development is above the threshold. The narrow confidence interval

for majority of the countries in the sample suggests that the estimations are quite precise. Notwithstanding this evidence, a close examination of the results show that, for most part, domestic level of financial sector development largely inhibits international trade irrespective of the indicator of finance and trade.

Thus, the nonlinearities in the finance-trade nexus play a substantial role in the recent trade flows in Africa. A possible reason for the continent's persistent low cross-border trade is the overall weakness in the domestic financial sectors. This study has far reaching policy implications for less developed economies, many of which may depend on trade for economic growth but suffer from under-developed financial markets. An important implication of the study is that, for most part, financial sector development supports countries' trade volumes above their respective finance threshold. Although finance may negatively affect trade when domestic finance sector proxies are below the threshold, with many countries approaching (or have even exceeded) the relevant thresholds of financial development as a result of reforms to improve the domestic financial sector above the optimal negative effect increasingly diminishes with the size of the financial sector above the optimal levels.

Intuitively, exporting firms benefit from better developed financial sectors and increased credit availability stemming from higher financial sector development. However, too much finance does not automatically spur international trade. While increase in financial development motivated by higher business investment can be linked with higher export capacities and hence improved trade, higher credit driven by the non-tradable sectors potentially inhibits international trade.

133

Conclusively, the study argues that, the link between finance and trade might be nuanced and too complex than what the simple relationships portray and whether finance supports or limits international trade crucially depends on the attainment of a certain threshold which is both country and indicator–specific. It is therefore imperative for countries to identify their unique financial development thresholds and operate within the optimal level in such a way that trading with the international markets is not jeopardized.

## **CHAPTER SEVEN**

# EMPIRICAL RESULTS: FINANCIAL DEVELOPMENT, SECTORAL EFFECTS AND INTERNATIONAL TRADE

#### 7.1 Introduction

This chapter presents the empirical findings on the relationship among financial development, sectoral value additions and international trade in Africa. It begins by presenting the descriptive statistics before discussing the empirical evidence on the effect of financial development and sectoral value addition on international trade.

#### 7.2 Empirical Results

#### 7.2.1 Descriptive statistics

Table 7.1 presents results on the descriptive statistics of the variables categorized into three thematic areas which include financial development, trade and sectoral value additions.

|                  | Financial development |          | Tr      | ade      | Sectoral value additions |         |          |
|------------------|-----------------------|----------|---------|----------|--------------------------|---------|----------|
| -                | Private               | Domestic | Exports | Trade    | Agric                    | Service | Industry |
|                  | credit                | credit   | Exports | openness |                          |         |          |
| Mean             | 19.21                 | 31.99    | 30.92   | 72.68    | 27.89                    | 44.43   | 27.79    |
| St. dev.         | 20.82                 | 63.59    | 18.93   | 46.05    | 16.56                    | 11.29   | 14.19    |
| Minimum          | 0.16                  | 0.09     | 2.52    | 6.32     | 0.89                     | 4.14    | 1.88     |
| Maximum          | 160.12                | 266.18   | 124.39  | 531.74   | 93.99                    | 74.77   | 84.28    |
| Skewness         | 3.37                  | 22.28    | 1.27    | 3.62     | 0.40                     | -0.15   | 1.18     |
| Kurtosis         | 17.75                 | 703.07   | 5.17    | 25.96    | 2.59                     | 2.86    | 4.59     |
| Percentiles      |                       |          |         |          |                          |         |          |
| 25 <sup>th</sup> | 7.70                  | 11.93    | 17.48   | 45.89    | 13.68                    | 36.65   | 17.20    |
| 50 <sup>th</sup> | 13.68                 | 21.34    | 25.87   | 60.36    | 27.27                    | 45.05   | 25.17    |
| 75 <sup>th</sup> | 22.57                 | 39.33    | 41.18   | 90.61    | 39.39                    | 52.16   | 33.57    |

Note: All the variables are measured as a percentage of GDP. St. dev. denotes standard deviation.

Table 7.1 shows the summary statistics of the annual variables averaged over the period 1980–2016. With regard to financial development, the mean private credit is 19.21% of GDP relative to domestic credit which measures at 31.99% of GDP. Thus, domestic credit is higher than private credit. The study notices that proxies of international trade which are exports and trade openness record average values of 30.92% and 72.68% (both as a percentage of GDP), respectively with standard deviations of 18.93 and 46.05. Given the values of trade openness, it is clear that the continent is relatively more opened to the international market. The three sectoral value additions agriculture, service and industry recorded averages of 27.89%, 44.43% and 27.79%, respectively. The relatively higher service sector's sectoral value addition identifies the service sector as the dominant sector in the economy. This evidence is consistent with UNCTAD (2015).

With regard to the skewness, the evidence is that, apart from the service sector, all the variables are positively skewed. There is a depiction of the correlation matrix of the series in Table 7.2.

|                | Private  | Domestic | Exports | Trade    | Agric | Sory  | Indu  |  |
|----------------|----------|----------|---------|----------|-------|-------|-------|--|
|                | credit   | credit   | Exports | openness |       | Serv. | muu.  |  |
| Private credit | 1.000    |          |         |          |       |       |       |  |
| Domestic       | 0 706**  | 1 000    |         |          |       |       |       |  |
| credit         | 0.700**  | 1.000    |         |          |       |       |       |  |
| Exports        | 0.299*** | 0.133**  | 1.0000  |          |       |       |       |  |
| Trade          | 0 28/**  | 0 1/15** | 0 05/** | 1 000    |       |       |       |  |
| openness       | 0.204    | 0.145    | 0.954   | 1.000    |       |       |       |  |
| Agric.         | -0.069   | 0.151    | -0.075  | 0.006    | 1.000 |       |       |  |
| Serv.          | 0.192*   | 0.172    | 0.123   | 0.129**  | 0.783 | 1.000 |       |  |
| Indu.          | 0.163    | 0.079*   | 0.241   | 0.193*   | 0.624 | 0.914 | 1.000 |  |

 Table 7.2:
 Correlation coefficient matrix

Note: \*, \*\* and \*\*\* respectively denote significance at 10, 5 and 1%. Agric., serv., and indu. represent the agriculture, service and industrial sectors respectively.

The correlation coefficient reveals a positive and significant relationship between financial development and trade proxies. However, the correlation between private credit and trade is relatively stronger than trade and domestic credit. There is also a strong positive and significant correlation between private and domestic credit. The evidence is not surprising given the association between the two indicators of finance. Interestingly, domestic and private credits are positively correlated with all the sectoral values except private credit and the agricultural sector. There is evidence of stronger correlations among all the three sectors revealing some degree of sturdier linkages. It should also be noted that industry captures manufacturing as a component in the classification of the sectoral value additions.

# 7.2.2 Estimations of short and long run relationships among finance, sectoral value additions and international trade

This section presents findings on the short and long run relationships between international trade and the independent variables. This is done separately for the two proxies of international trade (exports and trade openness) and financial sector development (private and domestic credit). Our estimation approach is the pooled mean group (PMG) which is built on the panel extension of a single equation in autoregressive distributed lag (ARDL) structure where a contemporaneous effect and an error correction framework towards long run equilibrium are examined. Since all the variables are in logarithmic form, we interpret their coefficients as elasticities. Table 7.3 presents findings on the estimations of the PMG.<sup>10</sup>

<sup>&</sup>lt;sup>10</sup> We present results on the stationarity properties of our variables and cointegration in Appendices 1 and 2 respectively.

|                             |                      | Exp                  | ports                |                      | Trade openness       |                      |                      |                      |  |
|-----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--|
| Variables                   | Private              | Private credit       |                      | Domestic credit      |                      | Private credit       |                      | Domestic credit      |  |
|                             | 1                    | 2                    | 3                    | 4                    | 5                    | 6                    | 7                    | 8                    |  |
| Short run:                  |                      |                      |                      |                      |                      |                      |                      |                      |  |
| Finance                     | -0.029<br>[0.460]    | -0.019<br>[0.148]    | -0.019<br>[0.181]    | -0.103<br>[0.244]    | 0.0190<br>[0.445]    | 0.023<br>[0.696]     | -0.012<br>[0.227]    | -0.051<br>[0.721]    |  |
| Agriculture                 | -0.131<br>[0.293]    | _                    | -0.303<br>[0.370]    | _                    | -0.512<br>[0.271]    | _                    | -0.270<br>[0.723]    | _                    |  |
| Service                     | 0.112<br>[0.405]     | -0.721<br>[0.132]    | 0.136<br>[0.612]     | -0.193<br>[0.201]    | 0.218<br>[0.481]     | -0.340<br>[0.121]    | 0.931<br>[0.529]     | -0.194<br>[0.242]    |  |
| Industry                    | 0.813***<br>[0.002]  | 0.420***<br>[0.001]  | 0.469***<br>[0.003]  | 0.642***<br>[0.004]  | 0.701***<br>[0.001]  | 0.501***<br>[0.007]  | 0.691***<br>[0.000]  | 0.521***<br>[0.003]  |  |
| Long run:                   |                      |                      |                      |                      |                      |                      |                      |                      |  |
| Finance                     | -0.121<br>[0.310]    | -0.281<br>[0.112]    | -0.197<br>[0.132]    | -0.204<br>[0.331]    | 0.125<br>[0.326]     | 0.107<br>[0.340]     | 0.200<br>[0.421]     | 0.119<br>[0.432]     |  |
| Agriculture                 | 0.192*<br>[0.071]    | _                    | 0.184***<br>[0.000]  | _                    | -0.172<br>[0.312]    | -                    | 0.184<br>[0.453]     | _                    |  |
| Service                     | -0.317*<br>[0.078]   | -0.181***<br>[0.001] | -0.119*<br>[0.081]   | -0.213***<br>[0.001] | 0.200<br>[0.507]     | -0.253<br>[0.318]    | 0.178<br>[0.831]     | -0.131<br>[0.400]    |  |
| Industry                    | 0.201**<br>[0.021]   | 0.351***<br>[0.000]  | 0.214**<br>[0.043]   | 0.374***<br>[0.001]  | -0.113<br>[0.523]    | 0.143<br>[0.765]     | -0.242<br>[0.576]    | 0.454<br>[0.723]     |  |
| Error<br>Correction<br>Term | -0.343***<br>[0.000] | -0.365***<br>[0.000] | -0.387***<br>[0.000] | -0.303***<br>[0.000] | -0.311***<br>[0.000] | -0.301***<br>[0.000] | -0.223***<br>[0.000] | -0.299***<br>[0.000] |  |
| Constant                    | -0.138<br>[0.000]    | -0.235<br>[0.000]    | -0.189<br>[0.000]    | -0.123<br>[0.000]    | -0.153<br>[0.012]    | 0.412<br>[0.432]     | 0.223<br>[0.532]     | 0.422<br>[0.001]     |  |
| Diagnostics                 |                      |                      |                      |                      |                      |                      |                      |                      |  |
| Log<br>Likelihood           | 734.123              | 913.321              | 892.562              | 823.142              | 942.921              | 813.232              | 862.432              | 901.203              |  |
| Observations                | 1,610                | 1,610                | 1,610                | 1,610                | 1,610                | 1,610                | 1,610                | 1,610                |  |
| Number of countries         | 46                   | 46                   | 46                   | 46                   | 46                   | 46                   | 46                   | 46                   |  |

 Table 7.3:
 Finance, sectoral value additions and international trade

Notes: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively. Estimations are done using STATA command xtpmg.

The results from Table 7.3 show that, in both the short and long run, financial development irrespective of the indicator has an insignificant effect on international trade. What is intriguing in these findings is that there is an inverse relationship between financial development and international trade as can be seen with all the negative coefficients across all the finance–trade measures except the private credit–trade openness. This implies that financial development to a large extent dampens trade in Africa which is inconsistent with Beck (2002) and Kim et al. (2010b). One intuitive expectation is a positive effect of finance

on trade where well-developed financial sector spurs international trade. The data does not, however, support this view given the insignificance effect of finance. In fact, if finance is to have any effect on trade, the finding suggests that such effect will be a dampening one given the negative coefficients of private and domestic credit. It also holds for all the proxies of international trade.

With regard to sectoral value addition, agriculture is one such important sector that cannot be ignored and is negative in the findings albeit insignificant in the short run. However, this effect turns positive in the long run and significant at conventional levels for only agricultural–export nexus. When agriculture value addition is increased by 1%, exports increases by 0.192% and 0.184% respectively if finance is proxied by private and domestic credit. The service sector does not appear to influence trade in the short run given the insignificant coefficients suggesting that, in the short run, well–developed service sector does not matter for international trade irrespective of the model specification and measures of finance and trade. Interestingly, in the long run, service sector negatively and significantly affects exports. Here, the magnitude of effect is high once we omit agricultural sector in the trade equation. However, for trade openness, changes in the service sector do not significantly influence trade.

With regard to the industrial sector, there is evidence of a short run complementarity effect between the industrial value additions and international trade given the positive and significant coefficients. More specifically, a unit–percentage increase in industrial value addition raises international trade with a coefficient ranging between 0.466% and 0.681%. A closed examination of the results reveals that the impact of the industrial sector is consistently higher for exports relative to trade openness. The long run effect is however mixed. While the

coefficients of the industrial sector remain positive albeit reduced coefficients, the effect is only significant for exports. Thus, the long run effects of industry on trade openness are imaginary.

The coefficients of the error correction terms in all the models are correctly signed. The negative and significant coefficients indicate that the models return to their long run equilibrium following a shock to the system that causes deviation from its steady state.

So far the evidence presented above reveals that, development of domestic financial sector does not appear to influence international trade both in the short and long run. This effect holds irrespective of the measure of finance and trade. However, the earlier analysis is mute on the transmission channels through which the various sectors of the economy may potentially mediate the relationship between international trade and domestic financial system. This is addressed this in the next section.

#### 7.2.3 Finance, sectoral value additions, transmission channels and trade

This section determines the interactive effect of sectoral growth in finance–trade nexus by examining how sectoral value additions arbitrate the relationship between financial development and international trade. This is done by sequentially introducing two sectors into the trade equation while alternating the measure of finance. Findings are presented in Table 7.4 below.

|                     | Exports        |            |           |                 | Trade openness |                |             |              |
|---------------------|----------------|------------|-----------|-----------------|----------------|----------------|-------------|--------------|
| Variables           | Priv           | ate credit | Dome      | Domestic credit |                | Private credit |             | c credit     |
|                     | 1              | 2          | 3         | 4               | 5              | 6              | 7           | 8            |
| Short run:          |                |            |           |                 |                |                |             |              |
| Finance             | 0.645          | -0.756     | -0.132    | -0.240          | 0.246          | -0.187         | 0.200       | -0.312       |
|                     | [0.123]        | [0.543]    | [0.243]   | [0.296]         | [0.745]        | [0.565]        | [0.423]     | [0.658]      |
| Agriculture         | 3.111          | _          | 4.321     | —               | 2.745          | -              | —           | -            |
|                     | [0.301]        |            | [0.578]   |                 | [0.376]        |                |             |              |
| Service             | -1.795         | -          | -3.876    | -               | -1.723         | -              | -0.367      | -            |
| T 1 .               | [0.198]        | 0.115      | [0.534]   | 0.625           | [0.987]        | 0.105          | [0.213]     | 0.400        |
| Industry            | -              | -0.115     | —         | 0.635           | -              | -0.105         | —           | 0.490        |
| <i>T</i> · · ·      |                | [0.756]    |           | [0.323]         |                | [0.434]        |             | [0.254]      |
| Transmissions:      | 0.001          |            |           |                 | 1 0 70         |                |             |              |
| $FIN \times AGRI$   | -0.231         | _          | -1.257    | -               | -1.970         | -              | _           | -            |
|                     | [0.576]        |            | [0.735]   |                 | [0.187]        |                | 0.001       |              |
| FIN × SERV          | 0.432          | _          | 0.956     | -               | 0.5/6          | -              | 0.321       | -            |
|                     | [0.119]        | 0.624      | [0.298]   | 0.444           | [0.272]        | 0.206          | [0.586]     | 0.412        |
| FIN XINDU           | —              | 0.024      | —         | -0.444          | _              | [0.290         | _           | -0.412       |
| Long run:           |                | [0.465]    |           | [0.374]         |                | [0.321]        |             | [0.318]      |
| Long run.           | -0 365***      | -0 400***  | _0 321*** | _0 497***       | _0 297***      | 0.200**        | _0.296***   | _0.312***    |
| Finance             | [0 000]        | 1000 01    | [0.000]   | 1000 01         | [0 000]        | [0.041]        | [0 000]     | [0.000]      |
|                     | 0.253*         | [0.000]    | 0.303***  | [0.000]         | -0.135         | [0.011]        | [0.000]     | [0.000]      |
| Agriculture         | [0.090]        | _          | [0.000]   | -               | [0.576]        | -              | _           | -            |
| <b>a</b> :          | -0.365***      |            | -0.623*** |                 | -0.405***      |                | -0.222***   |              |
| Service             | [0.000]        | _          | [0.000]   | -               | [0.001]        | -              | [0.000]     | -            |
| In directory        |                | -0.198     |           | -0.260***       |                | -0.354**       | *           | -0.298 * * * |
| Industry            | _              | [0.165]    | _         | [0.005]         | _              | [0.000]        | _           | [0.000]      |
| Error Correction    | $-0.202^{***}$ | -0.221***  | -0.263*** | -0.285***       | -0.200***      | -0.241**       | * -0.223*** | -0.199***    |
| Term                | [0.000]        | [0.000]    | [0.000]   | [0.000]         | [0.000]        | [0.000]        | [0.000]     | [0.000]      |
| Transmissions:      |                |            |           |                 |                |                |             |              |
|                     | -0.043         |            | -0.065 ** |                 | -0.111         |                |             |              |
| FIN X AGRI          | [0.654]        | _          | [0.041]   | _               | [0.267]        | _              | _           | _            |
| FIN × SERV          | 0.201***       |            | 0.287***  |                 | 0.240**        |                | 0.112***    |              |
|                     | [0.000]        | _          | [0.000]   | _               | [0.027]        | _              | [0.000]     | _            |
|                     |                | 0.197**    |           | 0.213***        |                | -0.327         |             | 0.343        |
| FIN XINDU           | _              | [0.028]    | _         | [0.001]         | _              | [0.427]        | _           | [0.245]      |
| Constant            | -0.546         | -0.212     | -0.187    | -0.065          | 0.190          | -0.190         | 0.123       | 0.287        |
|                     | [0.000]        | [0.044]    | [0.000]   | [0.086]         | [0.353]        | [0.687]        | [0.031]     | [0.053]      |
| Diagnostics         |                |            |           |                 |                |                |             |              |
| Log Likelihood      | 645.754        | 876.434    | 787.663   | 856.342         | 894.543        | 845.532        | 867.644     | 845.564      |
| Observations        | 1,610          | 1,610      | 1,610     | 1,610           | 1,610          | 1,610          | 1,610       | 1,610        |
| Number of countries | 46             | 46         | 46        | 46              | 46             | 46             | 46          | 46           |

#### Table 7.4:Finance, sectoral value additions, transmission channels and trade

Notes: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively.

With regard to the impact of finance on exports, the data from Table 7.4 reveals that financial development whether measured by private or domestic credit does not have any significant effect on trade in the short run. However, in the long run, finance significantly hurts exports. For instance, when finance is proxied by private credit, a unit–percentage rise in finance significantly reduces long run exports by 0.365%. This deleterious impact is huge when the

agricultural and service sectors are dropped. Turning to domestic credit as an indicator of finance, the evidence suggests that, financial development negatively affects exports in the long run with a coefficient of -0.320. Similar to the private credit, it can be observed that the dampening effect of finance on exports is more negative when the agricultural and service sectors are omitted (column 4). The implication is that, while well-developed financial sectors do not influence exports in the short run, in the long run their effect is rather not export–enhancing at least based on the sample evidence. Importantly, the study observed that, the deleterious impact of finance on exports is huge measuring at least 1.24 times larger when proxied by domestic credit relative to private credit.

Interestingly, there is a mixed impact of finance on trade when the latter is measured by trade openness. In other words, while both private and domestic credits do not affect trade openness in the short run, in the long run their effect is inconclusive. For instance, when proxied by private credit, there is evidence to show that financial sector development positively and significantly influences trade openness while domestic credit does not enhance trade. More precisely, a 1% increase in private credit spurs trade openness by 0.297% (column 5) although this effect reduces to 0.200% (column 6) when agricultural and service sectors are dropped. This notwithstanding, a unit–percentage rise in domestic credit reduces long run trade openness by 0.296% (column 7). The export–damaging effect of domestic credit rises to 0.455% and remains significant at 1% when the industrial sector is controlled for (column 8). This evidence largely reveals that, the precise impact of finance on trade depends on the time period, measures of finance and trade. This finding is consistent with Kim et al. (2010b). Nonetheless, there is sufficient evidence to suggest that financial sector development is not trade–enhancing for Africa based on the sample. The intuition is that, to the extent that countries in the continent have fragile with weak financial institutions, a

potential attendant consequence of such financial under-development is the rising transaction costs and risks resulting from financial liberalization thus inhibiting international market integration in the long run.

Turning to the sectoral effects on trade, results from the estimations show that, in the short run, none of the sectors has any significant impact on trade although the coefficients of agriculture and service sectors have been consistent. In the long run, only the agricultural sector enhances exports with a dampening impact on trade openness albeit insignificantly. Specifically, when only the agricultural and service sectors are controlled for, the coefficient of agriculture is positive and marginally significant at 10% (column 1). For the service sector, the impact on exports is negative and significant at 1%. In this estimation, the negative effect of the service sector is 1.44 times larger than the positive effect of the agricultural sector. With regard to trade openness, a unit–percentage rise in private and domestic credit significantly decreases trade openness by 0.297% and 0.296%, respectively (columns 5 and 7). The study further controlled for industrial sector as well dropping the agricultural and service sectors. The industrial sector also does not appear to promote trade given the negative and largely significant coefficients.

We now turn to transmission channel of sectoral growth on international trade via financial sector development. In other words, the study sought to empirically determine whether growth of the various sectors of the economy interact with finance to influence international trade. While finance may not directly influence trade in both the short and long run, improvement in domestic financial system may serve as a conduit through which both the tradable and non-tradable sectors of the economy affects cross-border trade. Specifically, the study hypothesizes that sectoral value additions positively impacts on trade through its effects

on the domestic financial sector. This was examined by including a multiplicative interactive terms of the various proxies of finance with each sector in the trade equation while controlling for the standard covariates. From equation (4.21), four possibilities can be found from the conditional impact of finance. First, if both  $\xi$  and  $\psi < 0$ , then development of the domestic financial sector does not enhance international trade and sectoral growth exacerbates the negative effect. Second, if both  $\xi$  and  $\psi > 0$ , then financial sector development spurs international trade and sectoral growth magnifies the positive effect. Third, if  $\xi < 0$  and  $\psi > 0$ , then development of the domestic financial sector does not enhance international trade and sectoral growth dampens the negative sectoral effect. Finally, if  $\xi > 0$  and  $\psi < 0$ , this study concludes that domestic financial sector promotes international trade and sectoral growth dampens the positive effect on trade. Results from the short run effects show, that for the most part, a positive coefficient of the interactive terms except for agricultural sector. However, none of them is statistically significant at conventional levels, suggesting that the short run conditional financial sector development effect is imaginary. This finding may be unsurprising. Anecdotally, well-developed financial sector is expected to boost sectoral growth through its efficient allocation of resources, diversifying risk and ameliorating information asymmetry. Consequently, growth in sectoral value addition is presumed to influence cross-border trade. However, there is no evidence for this in the short run. Perhaps, the relatively under-developed financial systems of the countries under consideration are insignificant in driving trade through its indirect effect on the sectors of the economy.

Conversely, in the long run, when finance is proxied by private credit, there is a negative direct effect of finance and positive (and significant) interactive term of finance in the service sector (column 1). The implication is that, while financial development does not enhance

long run trade, development of the service sector dampens the negative effect of finance on exports although the direct effect of private credit is exceedingly higher. This finding is robust when domestic credit is used to measure finance with a marginal rise in the conditional impact. Interestingly, while the impact of the interactive term of finance and agricultural sector on trade is negative, it is only significant for domestic credit (column 3). In particular, both the direct and indirect impact of finance is negative suggesting that, while finance hurts exports, development of the agricultural sector exacerbates the deleterious effect of finance (column 3). Given the coefficients of –0.043 and 0.201 for joint conditional effect of private credit and agriculture; and private credit and service, the study computes their net effects as – 1.564 and 8.565 respectively.<sup>11</sup>

Further evidence also suggests that a well-developed industrial sector also makes the negative impact of private credit on exports less malignant given its positive and significant interactive term. A possible elucidation of the dampening impact of the industrial sector can be drawn from the demand–following hypothesis which contends that the growth of real economic activities spurs demand for financial services and consequently the development of financial sector thus causing a uni–directional causality from finance to real sector (see Odhiambo, 2004). Although finance does not promote trade, the growing industrial sector invariably uses resources provided by the financial sector in their production process and as such, growth of the real sectors of the economy heightens the demand for these financial intermediation roles, efficient resource allocation and screening of *ex ante* and *ex post* investments. In the long run, these indirect effects jointly work to increase export on the back of higher value additions facilitated in part by the financial system.

<sup>&</sup>lt;sup>11</sup> The net effect is computed as: [(coefficient of the interactive term  $\times$  mean of sectoral value addition) + coefficient of finance].

Turning to the conditional impact of finance on trade openness, there is no evidence that finance – whether proxied by private or domestic credit – interacted with the real sectors improve countries' integration with the international markets. Thus, the joint impact of finance and real sectors of the economy do not matter in trade openness whether in the short or long run. However, only the conditional impact of the service sector and financial development matter for long run trade openness. This holds true for both proxies of finance although the indirect effect via private credit is greater (column 5). Interestingly, given the long run unconditional impact of private and domestic credit, the data suggests that only the indirect effect of the service sector on trade is significant. More precisely, there is evidence that, when interacted with the service sector, higher private credit amplifies its positive conditional impact while improving domestic credit dampens its negative unconditional effect on trade openness with a net effect of 10.366 and 4.680 for private and domestic credit respectively.

Beyond the coefficients, we examine the error correction behaviour of the models relying on the error correction terms produced by the PMG. Consistent with theory, all the error correction terms are negative and highly significant at 1% suggesting a mean reverting process. A practical implication is that disequilibrium in the system following a shock eventually diverting the steady state track tends to be corrected towards a long run path.

#### 7.3 Policy Implications and Recommendations

Drawing from the findings of the study, we highlight the key implications for policy while offering crucial recommendations. The past three decades have seen restructuring in both the financial and real sectors of many countries in Africa in a way that support countries' integration with the world market. This study examined the impact of financial sector

development and sectoral contributions to international trade in Africa over the period spanning 1980–2016. From our analysis, it is evident that irrespective of the indicator of finance and trade, higher finance does not appear to significantly support trade. This holds both in the long and short run. For the sectoral value additions, the data reveals that while the industrial sector positively influences international trade in the short run, irrespective of the proxy of finance and trade, in the long run, only the impact of finance on exports is significant. There is also evidence to show that the service sector drags long run trade. After including the indirect effect, it is evident that the impact of finance on trade is largely negative and significant in the long run. In the short run, finance effect on trade is benign. On the transmission channels, the evidence from the data suggests that well-developed service and industrial sectors significantly dampen the negative effect of finance on long run trade. However, only the transmission channels via service sector is robust. For the other sectors, the indirect effect is only significant for exports.

Indeed, theoretically, well-developed financial system spurs international trade, either by serving as insurance instrument or leading in countries' comparative advantage. Countries with less (more) credit market restrictions specialize in sectors that draw on heavy (low) external finance. Thus, higher finance leads to comparative advantage in industries that relatively depend on external financing and this can be a potential source of differences in trade regimes of countries. Conversely, the risk diversification role of higher domestic financial sector holds that countries with well-developed financial system are able to produce risky goods and services with lower risk premiums. Consequently, such economies are better able to diversify their risk and well-integrated with the international markets. Therefore, finance and trade have potential long run complementarity effect. However, there is no evidence for this even in the presence of sectoral value additions. Rather, a co-existence of

negative long run substitutionarity between finance and trade is found and this holds irrespective of the proxy of finance and trade. For low financially–developed countries, such as those in Africa, improvement in the financial sector has an insignificant short run effect on both exports and trade openness.

In fact, provision of the right and optimal level of finance to firms should improve trade as constraint to access finance is eliminated in such a way that firms are better able to cover fixed entry cost hence higher exports by incumbent firms. Consequently, this is expected to spur bilateral trade at the aggregated level. In terms of its manifestations, as trade barriers are lifted and countries open their economics to trade, the nascent financial sectors move to channel resource to finance new economic ventures of the real sector. Indeed, following from the supply-leading hypothesis which holds that finance leads economic activity, the higher financial intermediation is critical in countries' transition towards a higher growth trajectory. Beyond this transition stage, finance–trade nexus may move to a new stable equilibrium where relationship may well be mediated by sectoral value additions rather than finance and trade mutually reinforcing each other. As espoused by Kim et al., (2010b), because the path towards better development of the financial instability, especially for developing countries such as Africa, financial development may be deleterious to international trade at cyclical frequencies.

Indeed, financial under-development potentially inhibits financial intermediation, thus increasing transaction cost, all of which drags trade, especially if trading parties and financial intermediaries do not provide the necessary financing. It is on record that many countries in Africa have comparative advantage in agriculture owing to the abundant factor endowments,

productivity as well differences in costs from dynamic economies of scale (Collier & Venables, 2007; Wood & Mayer 2001). However, the spatial and risky nature of the sector creates unique challenges for the financial sector (Meyer, 2011). Relative to the other real sectors of the economy, the inability of financial intermediaries to offer financial resources to the agricultural sector stemming from the risk-averse commercial financial institutions have led to limited credit availability to support the agricultural sector's production. As such, the demand for finance and better financial intermediation by the agents in the agricultural sector is not strong enough to improve the relationship between finance and trade. Consequently, if agricultural sector will have any impact on trade through finance, such effect would rather be magnifying the deleterious impact of finance on trade. However, the service and industrial sectors are seen as a safe destination for bank credit largely because they are immune from the spatial problems of the agricultural sector. For these sectors, their growth and hence demand for better financial intermediation is expected to improve on long term financial development based on the demand-following hypothesis. The evidence from the data suggests that, although the industrial and service sectors dampen the negative effect of finance, this dynamic is more pronounced with the service sector. This finding is not farfetched. According to UNCTAD (2015) report, Africa's services sector contributes to almost half of the continent's output and measures more than twice the average rate for the world during 2009–2012. The report also argues that the agricultural, industrial and service sectors, respectively contribute 16%, 35% and 49% to the continent's real output. Given the higher contribution of the service sector, it is more likely for the financial sector to support the activities of the service sector (such as telecommunications, transport and energy among others) through provision of improved financial services. Thus, to the extent that the service sector is highest contributor to output and trade, when complemented with better finance will by far dampen the possible negative effect of finance on overall trade.

To ensure improved international trade in Africa, building complementarity in a way that strengthens input–output and demand linkages among the industrial, agricultural, service and financial sectors should be crucial goal for policymakers in Africa.

#### 7.4 Conclusion

Despite the importance of domestic level of financial sector and sectoral value additions to international trade, existing studies on finance–trade nexus have failed to: (i) re–engage the debate where trade flows, sectoral value additions and domestic financial development are lower and (ii) investigate the mediating role of finance in influencing sectoral growth for improved international trade flows.

Earlier literature has considered panel dataset which combined both developed and developing economies as a single case without considering the unique effect of Africa. More importantly, the extent to which financial development referees the link between sectoral growth and trade remains an unexplored area. This study re–examined the impact of financial development on international trade as well as the sectoral channels through which finance influences international trade. By invoking the pooled mean group (PMG) on a panel data comprising 46 countries in Africa spanning 1980–2016, the findings show that, for both the long and short run, while the impact of financial development does not have a significant effect on trade, the effect of sectoral value additions is contingent on the proxy of trade. On the pass–through effect of finance, it is evident that while financial development negatively affects long run trade, sectoral value additions dampen the deleterious effect of finance on trade with huge impact recorded in the service sector. The study argues that such conditional impact of finance via sectoral growth may be guided by the demand–following hypothesis in the finance–growth literature. As a key policy prescription, building complementarity among

the various sectors of the economy including the financial sector while maintaining crossborder oversight in financial intermediation should be pursued by policymakers on the continent.

## **CHAPTER EIGHT**

#### SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

#### 8.1 Introduction

This chapter is divided into four sections. This section introduces the chapter while section 8.2 summarizes and concludes the study. Section 8.3 outlines the study's contribution to the literature. Finally, Section 8.4 outlines areas necessitating future research efforts.

#### 8.2 Summary of Findings and Conclusion

This thesis re-examined the nexuses between financial sector development and international trade in Africa with regard to three critical themes hitherto missing in the existing literature. First, apart from re-investigating the direct effect of finance on trade, this study also examines how finance affects trade volume through its impact on economic growth. In addition, the thesis determines the threshold effects of finance and how finance-trade plays out under well and less developed domestic financial sectors. It also examines the sectoral effects on countries' level of international trade and how finance interacts with sectoral value additions to influence trade. This study thus focused on prominent spaces in finance-trade linkage that have been relatively understudied. Through this thesis, answers are provided to the following important research questions:

- 1. How do financial sector development and economic growth affect trade in Africa?
- 2. To what extent is the overall impact of finance on trade threshold-specific?
- 3. What is the nature and sectoral channels through which financial development impacts on trade?

Thematically, the key findings are highlighted below:

#### 8.2.1 Financial development and economic growth effect on international trade

Although improving international trade on the back of financial sector development is one of the preoccupations of countries in Africa, empirical literature on financial development–trade nexus has not been rigorous in examining how finance shapes trade. This study examined the effect of financial development on international trade in Africa relying on data for 46 countries over the period 1980–2015. Results from the system generalized method of moments reveal differential effects of finance on trade. In particular, the study noticed that private credit does not promote trade while domestic credit positively affects trade. These effects are robust to measure of trade. Thus, improving the level of private (domestic) credit dampens (amplifies) exports and trade openness. However, there is a U–shaped relationship between private credit and trade measures, suggesting that financial sector development may be detrimental (helpful) to trade for economies with low (high) level of private credit.

#### 8.2.2 Threshold effects of finance-trade nexus

Studies on threshold effects of finance on trade have relied on rudimentary approaches where an exogenous quadratic term of finance is introduced into the trade equation. However, findings from such studies are far from being instructive as it obscures country's unique domestic conditions such as differences in the levels of financial sector development. By using data from 46 countries over the period 1980–2016 and invoking Hansen's (2000) sample splitting and threshold estimation technique, we re–examined the threshold effects of finance where the level of domestic financial sector development acts as a regime–switching trigger in the finance–international trade nexus. This study finds evidence of threshold effects for a number of countries in Africa suggesting that the precise impact of financial

development on international trade is threshold–specific given the various indicators of finance. The key finding is that, whether finance (dis)encourages trade depends on the optimal level of finance. In some countries, finance stifles or spurs trade in under–developed financial sectors where the domestic level of financial development falls below the threshold. In other countries too, the impact of finance is positive or negative in well–developed financial sectors where the domestic level of financial sector development is above the threshold. The main finding is that whether finance supports or limits international trade crucially depends on the attainment of a certain threshold which is both country and indicator–specific.

#### 8.2.3 Sectoral effects of finance in the level of international trade

Existing studies on financial development-international trade nexus have centered on the implications of finance for trade without investigating the transmission channels of finance on trade. More importantly, how financial sector development mediates the relationship between sectoral value additions and trade remains an unexplored area. This study addresses these gaps in the literature relying on panel data from 46 countries in Africa spanning 1980–2016. The evidence from the study, based on the pooled mean group (PMG) estimations, suggest that, for both the long and short run, while the impact of sectoral value additions is contingent on the proxy of trade, financial sector development does not have a significant effect on international trade. This holds irrespective of the measure of finance and international trade. However, after controlling for the transmission channels, a co–existence of a negative long run substitutability between finance and trade is found and this is invariant of the indicator of finance and trade. On the mediation role, there is evidence that higher sectoral value additions dampen the deleterious effect of finance on trade with huge impact emanating from the service sector.

#### 8.3 Contributions to Knowledge

This study contributes to the literature in so many ways. Specifically, it makes critical value additions to both the theoretical and empirical literature apart from its contributions to methodology and practice. We discuss each of these contributions below:

#### 8.3.1 Contribution to empirics

This study presents robust empirical evidence on how different measures of finance affects the different indicators of trade as well as how finance impacts on economic growth in finance–trade nexus in Africa. Second, the thesis also presents pioneering insights into the sectoral contributions to international trade and how financial development interacts with sectoral value additions to influence trade. Third, this thesis also presents fresh evidence on the threshold effects of finance on trade. Apart from establishing the unique optimal level of finance for each country, this thesis also brought to bear how finance affects international trade in countries when their domestic level of financial sector is below or above the threshold. To the best of the researcher's knowledge, this is the first empirical threshold study to conduct such an in–depth analysis on finance–trade link in Africa.

#### 8.3.2 Contribution to methodology

To the extent that each empirical chapter is self-contained, this thesis employs different methodologies given the unique nature of each chapter. Indeed, previous literature has often suffered from endogeneity, simultaneity and some cases reverse causality. Undoubtedly, existence of these problems affects the consistency of the parameters. This thesis resolves these issues through the systematic application of approaches that address these problems. Second, relative to earlier studies, this thesis models the finance thresholds without assuming

any *a priori* form in a way that does not only reveal the precise optimal value of finance but how finance–trade plays out below and above the threshold.

#### 8.3.3 Contribution to theory

Kletzer and Bardhan (1987) augmented the Heckscher–Ohlin model where financial sector decreases the cost in relation to countries' search for their comparative advantage and hence improved trade flows. Beck (2002) extended Kletzer and Bardhan's (1987) theoretical work by allowing sectors to depend on external finance, one being more credit intensive due to increasing returns to scale. To be able to allow developing countries to make prudent policies relating to finance and international trade, this thesis blends these theories in unearthing some threshold linkages in finance and international trade. The evidence is expected to provide a springboard for further theoretical studies by proposing the existence of some unique thresholds in the finance–trade nexus.

#### 8.3.4 Contribution to practice (policy recommendations)

This section thematically highlights the key implications for policy and practice from each empirical chapter.

#### 8.3.4.1 Financial sector development and its relationship with international trade

Evidence from the data suggests that, improving the level of domestic credit propels exports and trade openness. More importantly, private credit only improves exports and trade openness when its threshold is exceeded. The implication is that, countries in Africa will only benefit from finance–enhancing trade effect when the average level of financial development is above their respective thresholds. To the extent that none of the countries have domestic financial systems above the threshold with only few approaching the relevant thresholds of

financial development given their average financial depth, what is needed here is a good understanding of the optimal level of credit consistent with long run international trade. Thus, it is imperative for Central Banks in Africa to aggressively move private credit to GDP towards an optimal level in a way that does not culminate in credit boom. It is therefore crucial for the Central Banks to maintain a sound supervision of the financial markets with the aim of improving financial intermediation in supplying the right quality and quantity level of finance.

#### 8.3.4.2 Threshold effects of finance and its mediation role in finance-trade nexus

Anecdotally, possible reasons for Africa's persistent low trade flows can partly be attributed to the level of domestic financial systems. This thesis presents some empirical evidence on the threshold effects of finance on trade and this has important implications for policy makers. For most part, financial sectors crucially support trade when the domestic level of financial sector development is above their respective finance thresholds. Although finance may negatively affect trade when domestic financial sector proxies are below the threshold, with many countries approaching (or even exceeded) the relevant thresholds of financial development as a result of reforms to improve the domestic financial systems, the marginally negative effect increasingly diminishes with the size of the financial sector above the optimal levels. It is therefore imperative for countries to identify their unique financial development thresholds and operate within the optimal level in such a way that trading with the international markets is not jeopardized.

#### 8.3.4.3 Financial development, sectoral value additions and international trade

A key policy implication emanating from this thesis is that, improving domestic financial services is important to ensure a healthy and sufficient liquidity of finance that is consistent

with international trade. Given the increasing internationalization of financial intermediation, the emerging regulatory framework should be agile to respond to financial fragility. There is still room for better regulation of domestic financial sector to help improve financial institutions' risk-taking behavior. However, given the low financial sector development in spite of the rigorous financial sector reforms, some sort of industrial policy may be important in supporting the diversification and expansion of production across the various sectors. To guarantee improved international trade in Africa, it is imperative for policy makers to tailor policies that aim to build complementarities in a way that braces input–output and demand linkages among the industrial, agricultural, manufacturing, services and financial sectors.

#### 8.4 Areas Necessitating Further Research Efforts

Here are two key areas for further research. First, it would be instructive to explore the linkages through which finance affects international trade in Africa given the current study's failure to find the indirect effect of finance on trade via economic growth. Potential candidates could include countries' level of human capital stock and net foreign direct investment (FDI) inflows. Second, given the differential effect of finance on international trade, it is likely that finance–trade nexus may also be mediated by some crucial threshold variables suggesting that whether finance dampens or magnifies international trade is conditioned on countries' attaining some thresholds with regard to the quality of institutions, economic growth, population and inflation. Investigating these would entail splitting the sample based on the threshold values identified while applying the threshold estimations.

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### **APPENDICES**

| I.I             |   |   |  |           |   |
|-----------------|---|---|--|-----------|---|
| Series          | LLC-stat<br>H <sub>o</sub> : Panels<br>contain unit<br>root | Breitung<br><i>t</i> -stat<br>H <sub>o</sub> : Panels<br>contain unit | BreitungHadrit-statZ-statHo: PanelsHo: Allcontain unitpanels arerootstationary |           | Harris–<br>Tzavalis Z-stat<br>H <sub>o</sub> : Panels<br>contain unit |
|                 | 0.092   | 1 721   | 21 510***  | 2 964***  | 0 134***  |
| Domestic credit | [0.537]   | [0.957]   | [0.000]  | [0.002]   | [0.000]   |
| D' 11           | -0.171  | 3.485   | 61.158***  | -2.441    | 0.734***  |
| Private credit  | [0.432]   | [0.100]   | [0.000]  | [0.993]   | [0.000]   |
|                 | -2.646***   | -1.806**  | 51.957***  | 4.265***  | 0.741***  |
| Exports         | [0.004]   | [0.036]   | [0.000]  | [0.000]   | [0.001]   |
| Trada anonnaga  | -3.945***   | -1.785**  | 52.034***  | 4.807***  | 0.732***  |
| Trade openness  | [0.000]   | [0.037]   | [0.000]  | [0.000]   | [0.000]   |
| Agriculture     | -3.392***   | -1.393*   | 61.753***  | 14.388*** | 0.700***  |
| Agriculture     | [0.000]   | [0.082]   | [0.000]  | [0.000]   | [0.000]   |
| Service         | -0.462  | -0.188  | 62.713***  | 6.374***  | 0.768**   |
| Scivice         | [0.322]   | [0.426]   | [0.000]  | [0.000]   | [0.033]   |
| Industry        | -2.171**  | -0.173  | 56.217***  | 2.023**   | 0.785   |
| maasay          | [0.015]   | [0.431]   | [0.000]  | [0.022]   | [0.173]   |
|                 |   |   |  |           |   |

### Appendix 1: Panel Unit Root Tests

Notes: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively. Values in [] are the *p*-value

| Approach   | Test statistics | Expo  | orts            | Trade openness |       |  |
|------------|-----------------|---|-----------------|----------------|-------|--|
| rpprouon   |                 | ExportsTrade opennessz-value $p$ -value $z$ -value $p$ -value-4.292***0.000-4.607***0.00-1.821**0.034-0.9870.16-3.463***0.000-3.777***0.00-3.009***0.001-2.961***0.002.220**0.0251.949*0.02-3.523***0.000-3.136***0.00-3.752***0.000-3.442***0.00 | <i>p</i> -value |                |       |  |
|            | G <sub>t</sub>  | -4.292***   | 0.000           | -4.607***      | 0.000 |  |
| Westerlund | $G_a$           | -1.821**  | 0.034           | -0.987         | 0.162 |  |
| westeriunu | $P_t$           | -3.463*** 0.000   |                 | -3.777***      | 0.000 |  |
|            | $P_a$           | -3.009***   | 0.001           | -2.961***      | 0.002 |  |
|            | Panel–v         | 2.220**   | 0.025           | 1.949*         | 0.051 |  |
|            | Panel-rho       | -3.523***   | 0.000           | -3.136***      | 0.000 |  |
| Pedroni    | Panel-t         | -3.752***   | 0.000           | -3.442***      | 0.000 |  |
|            | Panel–ADF       | -3.107***   | 0.000           | -2.305***      | 0.002 |  |

### **Appendix 2:** Panel Cointegration Tests

Notes: \*, \*\* and \*\*\* denote significance at 10, 5 and 1% respectively. Pedroni's Panel statistics and that of Westerlund's are weighted. We do not bootstrap the critical values of the Westerlund.

|      | Private<br>credit | Domestic credit | Exports   | Trade<br>openness | Real GDP per capita | Private<br>credit | Domestic credit | Exports  | Trade openness | Real<br>GDP per<br>capita |
|------|-------------------|-----------------|-----------|-------------------|---------------------|-------------------|-----------------|----------|----------------|---------------------------|
|      |                   |                 | Algeria   | ı                 |                     |                   |                 | Angola   |                |                           |
| Mean | 27.59             | 42.04           | 31.07     | 57.33             | 3,860.07            | 6.53              | 7.34            | 51.81    | 96.15          | 2,262.38                  |
| Max  | 69.31             | 99.35           | 48.81     | 76.68             | 4,759.60            | 27.22             | 57.88           | 89.63    | 178.99         | 3,747.57                  |
| Min  | 3.91              | -12.70          | 12.85     | 32.68             | 3,164.90            | 0.00              | -14.76          | 0.00     | 0.00           | 0.00                      |
| SD   | 24.85             | 33.51           | 9.47      | 10.78             | 471.89              | 8.61              | 13.09           | 28.33    | 51.47          | 1,123.82                  |
| Obs  | 37                | 37              | 37        | 37                | 37                  | 37                | 37              | 37       | 37             | 37                        |
|      |                   |                 | Benin     |                   |                     |                   |                 | Botswana |                |                           |
| Mean | 17.64             | 16.43           | 21.47     | 55.37             | 682.01              | 17.12             | -22.96          | 54.10    | 102.77         | 4,630.79                  |
| Max  | 31.84             | 32.13           | 32.08     | 76.53             | 833.66              | 33.81             | 14.73           | 75.13    | 124.65         | 7,574.28                  |
| Min  | 5.42              | 3.18            | 13.50     | 38.30             | 577.54              | 6.64              | -79.09          | 34.80    | 85.83          | 1,891.41                  |
| SD   | 8.08              | 8.74            | 4.68      | 8.00              | 73.17               | 7.96              | 27.77           | 7.99     | 13.22          | 85.83                     |
| Obs  | 37                | 37              | 37        | 37                | 37                  | 37                | 37              | 37       | 37             | 37                        |
|      |                   |                 | Burkina F | laso              |                     |                   |                 | Burundi  |                |                           |
| Mean | 13.86             | 13.67           | 12.64     | 40.56             | 429.26              | 12.79             | 21.64           | 8.64     | 35.71          | 265.64                    |
| Max  | 25.86             | 30.05           | 26.19     | 67.34             | 626.36              | 20.32             | 30.40           | 12.93    | 54.15          | 337.71                    |
| Min  | 6.79              | 5.58            | 7.88      | 28.37             | 303.05              | 3.57              | 13.60           | 4.69     | 20.96          | 219.19                    |
| SD   | 4.37              | 5.41            | 5.60      | 10.16             | 106.91              | 5.01              | 4.23            | 1.98     | 8.54           | 42.13                     |
| Obs  | 37                | 37              | 37        | 37                | 37                  | 37                | 37              | 37       | 37             | 37                        |
|      |                   |                 | Cape Ver  | rde               |                     |                   |                 | Cameroon |                |                           |
| Mean | 34.09             | 56.29           | 25.56     | 88.52             | 1,904.85            | 16.03             | 18.69           | 22.09    | 44.63          | 1,254.03                  |
| Max  | 65.74             | 85.70           | 45.13     | 117.82            | 3,405.78            | 31.24             | 37.55           | 33.48    | 65.02          | 1,726.84                  |
| Min  | 11.98             | 21.77           | 0.00      | 0.00              | 673.82              | 6.54              | 6.70            | 16.03    | 31.75          | 994.64                    |
| SD   | 17.61             | 19.68           | 9.82      | 19.09             | 1,032.05            | 8.30              | 7.28            | 4.55     | 8.59           | 194.63                    |
| Obs  | 37                | 37              | 37        | 37                | 37                  | 37                | 37              | 37       | 37             | 37                        |

### Appendix 3: Descriptive Statistics

|      | Private<br>credit | Domestic<br>credit | Exports      | Trade openness | Real GDP<br>per capita | Private<br>credit | Domestic<br>credit | Exports     | Trade openness | Real<br>GDP per<br>capita |
|------|-------------------|--------------------|--------------|----------------|------------------------|-------------------|--------------------|-------------|----------------|---------------------------|
|      |                   | Centr              | al African I | Republic       |                        |                   |                    | Chad        |                |                           |
| Mean | 8.06              | 18.04              | 17.89        | 44.81          | 442.19                 | 6.87              | 11.51              | 23.69       | 60.74          | 619.11                    |
| Max  | 15.12             | 37.11              | 26.88        | 66.30          | 545.52                 | 21.21             | 22.30              | 51.01       | 126.35         | 967.10                    |
| Min  | 3.96              | 10.85              | 10.68        | 33.21          | 300.48                 | 2.22              | -1.27              | 6.56        | 20.06          | 405.98                    |
| SD   | 3.28              | 6.65               | 4.57         | 8.80           | 60.04                  | 4.92              | 5.33               | 12.67       | 22.76          | 183.28                    |
| Obs  | 37                | 37                 | 37           | 37             | 37                     | 37                | 37                 | 37          | 37             | 37                        |
|      |                   | С                  | ongo Dem.    | Rep            |                        |                   | С                  | ongo Repu   | blic           |                           |
| Mean | 2.23              | 6.60               | 24.99        | 52.29          | 474.44                 | 11.47             | 12.80              | 66.14       | 120.71         | 2,644.47                  |
| Max  | 6.59              | 25.33              | 45.36        | 95.00          | 803.94                 | 31.68             | 33.10              | 87.28       | 165.65         | 3,292.43                  |
| Min  | 0.00              | 0.00               | 11.33        | 20.44          | 262.97                 | 2.10              | -16.13             | 39.83       | 57.14          | 2,248.06                  |
| SD   | 1.88              | 5.96               | 8.99         | 19.89          | 211.05                 | 7.42              | 15.22              | 15.22       | 27.33          | 267.19                    |
| Obs  | 37                | 37                 | 37           | 37             | 37                     | 37                | 37                 | 37          | 37             | 37                        |
|      |                   |                    | Cote d'Ivoi  | ire            |                        |                   | E                  | gypt Arab I | Rep            |                           |
| Mean | 23.64             | 31.25              | 41.13        | 76.14          | 1,415.00               | 35.08             | 89.80              | 22.04       | 51.86          | 1,883.40                  |
| Max  | 42.26             | 51.26              | 53.82        | 95.07          | 1,994.72               | 54.93             | 110.93             | 33.37       | 82.18          | 2,665.35                  |
| Min  | 9.75              | 14.41              | 29.44        | 55.35          | 1,138.67               | 13.18             | 69.42              | 12.56       | 34.85          | 1,192.58                  |
| SD   | 11.15             | 11.55              | 6.80         | 11.12          | 221.77                 | 11.59             | 12.24              | 5.93        | 11.86          | 465.46                    |
| Obs  | 37                | 37                 | 37           | 37             | 37                     | 37                | 37                 | 37          | 37             | 37                        |
|      |                   | Ed                 | quatorial G  | uinea          |                        |                   |                    | Ethiopia    |                |                           |
| Mean | 9.47              | 12.44              | 75.16        | 243.84         | 7,274.80               | 11.68             | 28.47              | 1.78        | 5.99           | 240.52                    |
| Max  | 38.23             | 68.67              | 124.39       | 531.74         | 20,333.94              | 24.96             | 49.45              | 16.69       | 48.23          | 487.29                    |
| Min  | 0.00              | -23.20             | 38.99        | 105.16         | 486.98                 | 0.00              | 0.00               | 0.00        | 0.00           | 0.00                      |
| SD   | 10.42             | 24.12              | 27.86        | 118.70         | 7,506.42               | 8.02              | 17.10              | 4.58        | 15.17          | 92.44                     |
| Obs  | 37                | 37                 | 37           | 37             | 37                     | 37                | 37                 | 37          | 37             | 37                        |

### Appendix 3: Descriptive statistics (continued)

| прр  | muia J.           | Descrip         | inte sta | usites (co     | minucu)             |                   |                    |             |                |                     |
|------|-------------------|-----------------|----------|----------------|---------------------|-------------------|--------------------|-------------|----------------|---------------------|
|      | Private<br>credit | Domestic credit | Exports  | Trade openness | Real GDP per capita | Private<br>credit | Domestic<br>credit | Exports     | Trade openness | Real GDP per capita |
|      |                   |                 | Gabon    |                |                     |                   |                    | Ghana       |                |                     |
| Mean | 12.95             | 17.46           | 54.99    | 90.21          | 10,503.47           | 9.25              | 25.81              | 26.25       | 63.81          | 1,025.29            |
| Max  | 29.74             | 40.76           | 69.03    | 119.85         | 12,665.80           | 20.44             | 39.30              | 48.80       | 116.05         | 1,685.99            |
| Min  | 6.59              | 2.32            | 35.19    | 73.52          | 8,449.93            | 1.54              | 16.38              | 3.34        | 6.32           | 701.53              |
| SD   | 5.22              | 7.58            | 8.32     | 9.89           | 1,209.09            | 5.85              | 6.40               | 12.61       | 30.48          | 277.78              |
| Obs  | 37                | 37              | 37       | 37             | 37                  | 37                | 37                 | 37          | 37             | 37                  |
|      |                   |                 | The Gamb | oia            |                     |                   | (                  | Guinea-Biss | au             |                     |
| Mean | 12.06             | 24.77           | 31.63    | 76.07          | 525.42              | 7.36              | 12.56              | 15.33       | 51.06          | 563.90              |
| Max  | 25.12             | 67.38           | 59.90    | 131.49         | 562.85              | 22.00             | 77.48              | 27.93       | 67.68          | 730.80              |
| Min  | 0.00              | -0.00           | 14.73    | 46.93          | 488.88              | 0.00              | 0.00               | 4.90        | 37.07          | 476.87              |
| SD   | 6.67              | 21.21           | 12.56    | 24.81          | 18.68               | 6.36              | 14.68              | 5.10        | 7.91           | 53.79               |
| Obs  | 37                | 37              | 37       | 37             | 37                  | 37                | 37                 | 37          | 37             | 37                  |
|      |                   |                 | Guinea   |                |                     |                   |                    | Kenya       |                |                     |
| Mean | 3.83              | 10.97           | 22.95    | 51.22          | 350.56              | 23.83             | 36.65              | 24.70       | 56.50          | 900.81              |
| Max  | 14.38             | 37.30           | 40.59    | 91.69          | 453.58              | 34.38             | 45.38              | 38.90       | 72.86          | 1,107.92            |
| Min  | 0.00              | 0.00            | 0.00     | 0.00           | 0.00                | 18.42             | 29.06              | 16.65       | 44.38          | 823.09              |
| SD   | 3.58              | 11.12           | 11.28    | 26.16          | 160.35              | 4.45              | 4.11               | 4.72        | 6.53           | 70.99               |
| Obs  | 37                | 37              | 37       | 37             | 37                  | 37                | 37                 | 37          | 37             | 37                  |
|      |                   |                 | Liberia  |                |                     |                   |                    | Libya       |                |                     |
| Mean | 5.90              | 151.89          | 30.45    | 96.81          | 544.65              | 11.85             | 16.21              | 26.94       | 44.22          | 3,546.47            |
| Max  | 20.64             | 2,066.18        | 82.45    | 311.36         | 1,461.13            | 32.53             | 107.95             | 73.56       | 107.70         | 12,120.56           |
| Min  | 0.00              | 0.00            | 0.00     | 0.00           | 115.79              | 0.00              | -114.69            | 0.00        | 0.00           | 0.00                |
| SD   | 6.45              | 339.80          | 26.70    | 86.85          | 418.73              | 11.98             | 57.60              | 26.25       | 40.65          | 4,935.47            |
| Obs  | 37                | 37              | 37       | 37             | 37                  | 37                | 37                 | 37          | 37             | 37                  |

### **Appendix 3: Descriptive statistics (continued)**

|      | Private<br>credit | Domestic<br>credit | Exports   | Trade<br>openness | Real<br>GDP per<br>capita | Private<br>credit | Domestic<br>credit | Exports    | Trade<br>openness | Real<br>GDP per<br>capita |
|------|-------------------|--------------------|-----------|-------------------|---------------------------|-------------------|--------------------|------------|-------------------|---------------------------|
|      |                   |                    | Lesotho   |                   |                           |                   |                    | Mali       |                   |                           |
| Mean | 13.83             | 8.01               | 11.50     | 42.00             | 867.97                    | 14.67             | 17.33              | 20.43      | 52.91             | 565.51                    |
| Max  | 22.02             | 39.88              | 50.03     | 152.50            | 1,371.78                  | 24.20             | 39.03              | 28.43      | 63.79             | 726.25                    |
| Min  | 5.26              | -18.42             | 0.00      | 0.00              | 549.10                    | 7.52              | 8.64               | 13.30      | 42.10             | 393.55                    |
| SD   | 4.18              | 17.95              | 18.36     | 64.47             | 247.74                    | 3.93              | 8.34               | 4.56       | 5.73              | 104.09                    |
| Obs  | 37                | 37                 | 37        | 37                | 37                        | 37                | 37                 | 37         | 37                | 37                        |
|      |                   |                    | Malawi    |                   |                           |                   |                    | Mauritania | ì                 |                           |
| Mean | 10.32             | 21.91              | 24.08     | 59.20             | 387.47                    | 15.38             | 21.49              | 41.52      | 100.13            | 1,097.62                  |
| Max  | 18.31             | 40.39              | 35.66     | 91.38             | 484.37                    | 36.18             | 52.26              | 59.91      | 140.70            | 1,326.16                  |
| Min  | 4.13              | 8.95               | 15.86     | 41.90             | 315.93                    | 0.00              | 0.00               | 21.45      | 57.12             | 966.47                    |
| SD   | 4.03              | 9.70               | 4.77      | 10.36             | 46.41                     | 14.36             | 19.87              | 9.95       | 22.36             | 107.96                    |
| Obs  | 37                | 37                 | 37        | 37                | 37                        | 37                | 37                 | 37         | 37                | 37                        |
|      |                   |                    | Mauritius |                   |                           |                   |                    | Morocco    |                   |                           |
| Mean | 55.18             | 75.54              | 56.66     | 118.43            | 5,238.54                  | 35.60             | 65.19              | 26.76      | 60.86             | 2,076.09                  |
| Max  | 106.31            | 120.35             | 68.46     | 137.11            | 9,468.94                  | 71.64             | 112.68             | 35.74      | 85.67             | 3,204.75                  |
| Min  | 21.43             | 44.69              | 44.54     | 93.25             | 2,264.91                  | 0.00              | 36.49              | 19.34      | 47.096            | 1,293.50                  |
| SD   | 26.16             | 24.55              | 6.53      | 11.25             | 2,175.96                  | 22.29             | 25.91              | 4.96       | 12.34             | 572.86                    |
| Obs  | 37                | 37                 | 37        | 37                | 37                        | 37                | 37                 | 37         | 37                | 37                        |
|      |                   |                    | Niger     |                   |                           |                   |                    | Nigeria    |                   |                           |
| Mean | 10.54             | 13.01              | 18.66     | 48.50             | 370.80                    | 14.10             | 25.71              | 30.21      | 51.05             | 1,655.79                  |
| Max  | 17.67             | 20.49              | 24.58     | 71.29             | 517.33                    | 38.39             | 48.67              | 51.73      | 81.81             | 2,563.09                  |
| Min  | 3.30              | 4.63               | 14.05     | 32.78             | 322.15                    | 8.71              | 4.91               | 10.63      | 21.12             | 1,151.13                  |
| SD   | 4.94              | 4.39               | 2.75      | 10.30             | 52.01                     | 6.10              | 11.84              | 10.16      | 16.37             | 461.65                    |
| Obs  | 37                | 37                 | 37        | 37                | 37                        | 37                | 37                 | 37         | 37                | 37                        |

### **Appendix 3: Descriptive statistics (continued)**

|      | Private<br>credit | Domestic<br>credit | Exports     | Trade openness | Real<br>GDP per<br>capita | Private<br>credit | Domestic<br>credit | Exports   | Trade openness | Real<br>GDP per<br>capita |  |
|------|-------------------|--------------------|-------------|----------------|---------------------------|-------------------|--------------------|-----------|----------------|---------------------------|--|
|      |                   |                    | Namibia     |                |                           |                   | Mozambique         |           |                |                           |  |
| Mean | 30.64             | 32.30              | 46.58       | 99.17          | 4,263.89                  | 11.90             | 9.89               | 17.58     | 60.53          | 269.20                    |  |
| Max  | 53.79             | 56.82              | 70.02       | 125.10         | 6,082.33                  | 35.11             | 43.17              | 33.43     | 118.12         | 510.79                    |  |
| Min  | 0.00              | 0.00               | 39.81       | 80.76          | 3,509.36                  | 0.00              | 0.00               | 2.52      | 14.33          | 131.65                    |  |
| SD   | 20.57             | 21.87              | 5.91        | 11.57          | 751.81                    | 9.53              | 10.89              | 10.78     | 26.18          | 117.89                    |  |
| Obs  | 37                | 37                 | 37          | 37             | 37                        | 37                | 37                 | 37        | 37             | 37                        |  |
|      |                   |                    | Rwanda      |                |                           |                   |                    | Senegal   |                |                           |  |
| Mean | 10.34             | 11.80              | 9.75        | 35.21          | 426.52                    | 24.62             | 30.69              | 26.96     | 66.61          | 906.03                    |  |
| Max  | 21.17             | 28.45              | 15.68       | 71.10          | 714.54                    | 37.55             | 46.31              | 35.18     | 86.96          | 1,054.98                  |  |
| Min  | 5.12              | 3.22               | 5.15        | 19.68          | 204.77                    | 14.69             | 19.64              | 20.26     | 49.64          | 789.79                    |  |
| SD   | 4.32              | 4.74               | 3.34        | 9.61           | 114.79                    | 7.11              | 8.60               | 3.28      | 9.53           | 71.85                     |  |
| Obs  | 37                | 37                 | 37          | 37             | 37                        | 37                | 37                 | 37        | 37             | 37                        |  |
|      |                   |                    | Sierra Leor | ie             |                           | South Africa      |                    |           |                |                           |  |
| Mean | 4.35              | 32.49              | 19.73       | 50.27          | 398.23                    | 108.34            | 134.20             | 27.23     | 52.25          | 6,471.06                  |  |
| Max  | 8.10              | 90.04              | 34.69       | 93.27          | 563.20                    | 160.12            | 192.66             | 35.62     | 72.87          | 7,627.85                  |  |
| Min  | 1.62              | 8.61               | 7.92        | 23.03          | 271.69                    | 0.00              | 0.00               | 20.70     | 37.49          | 5,517.51                  |  |
| SD   | 1.94              | 19.57              | 7.69        | 17.27          | 75.38                     | 38.00             | 45.59              | 3.72      | 8.39           | 689.65                    |  |
| Obs  | 37                | 37                 | 37          | 37             | 37                        | 37                | 37                 | 37        | 37             | 37                        |  |
|      |                   |                    | Sudan       |                |                           |                   |                    | Swaziland |                |                           |  |
| Mean | 7.77              | 18.80              | 10.39       | 25.98          | 1,090.62                  | 17.10             | 14.03              | 62.49     | 139.92         | 2,878.97                  |  |
| Max  | 13.96             | 39.57              | 24.10       | 47.58          | 1,881.90                  | 26.44             | 22.16              | 84.44     | 188.65         | 4,088.57                  |  |
| Min  | 1.62              | -4.87              | 3.34        | 11.09          | 707.75                    | 8.81              | 1.67               | 45.10     | 96.95          | 1,602.43                  |  |
| SD   | 4.22              | 10.81              | 5.85        | 10.59          | 356.85                    | 4.07              | 4.51               | 11.01     | 23.97          | 746.37                    |  |
| Obs  | 37                | 37                 | 37          | 37             | 37                        | 37                | 37                 | 37        | 37             | 37                        |  |

**Appendix 3: Descriptive statistics (continued)** 

|      | Private<br>credit | Domestic<br>credit | Exports  | Trade<br>openness | Real<br>GDP per<br>capita | Private<br>credit | Domestic<br>credit | Exports  | Trade<br>openness | Real<br>GDP per<br>capita |
|------|-------------------|--------------------|----------|-------------------|---------------------------|-------------------|--------------------|----------|-------------------|---------------------------|
|      |                   |                    | Tanzania |                   |                           |                   |                    | Togo     |                   |                           |
| Mean | 7.27              | 13.53              | 12.60    | 34.28             | 450.08                    | 21.98             | 25.84              | 39.00    | 90.22             | 522.24                    |
| Max  | 15.17             | 34.59              | 24.07    | 65.69             | 835.97                    | 37.68             | 43.26              | 52.70    | 125.03            | 683.35                    |
| Min  | 0.00              | 0.00               | 0.00     | 0.00              | 0.00                      | 8.63              | 14.94              | 24.38    | 56.48             | 411.18                    |
| SD   | 5.28              | 10.29              | 8.43     | 22.82             | 266.27                    | 6.92              | 7.10               | 7.36     | 15.61             | 50.73                     |
| Obs  | 37                | 37                 | 37       | 37                | 37                        | 37                | 37                 | 37       | 37                | 37                        |
|      |                   |                    | Tunisia  |                   |                           |                   |                    | Uganda   |                   |                           |
| Mean | 63.07             | 69.63              | 41.97    | 89.17             | 2,974.29                  | 6.57              | 11.65              | 12.99    | 36.13             | 402.52                    |
| Max  | 81.16             | 92.59              | 56.17    | 115.40            | 4,265.37                  | 15.26             | 38.20              | 24.28    | 56.26             | 653.87                    |
| Min  | 46.45             | 54.41              | 30.18    | 67.49             | 2,014.57                  | 0.00              | 0.00               | 7.06     | 22.30             | 0.00                      |
| SD   | 8.52              | 9.27               | 5.53     | 10.96             | 826.73                    | 4.63              | 8.48               | 4.39     | 9.01              | 159.24                    |
| Obs  | 37                | 37                 | 37       | 37                | 37                        | 37                | 37                 | 37       | 37                | 37                        |
|      |                   |                    | Zambia   |                   |                           |                   |                    | Zimbabwe | ;                 |                           |
| Mean | 10.62             | 43.55              | 19.33    | 40.85             | 1,157.90                  | 21.10             | 40.28              | 29.36    | 65.11             | 1,077.91                  |
| Max  | 24.18             | 83.29              | 40.48    | 84.60             | 1,620.82                  | 103.63            | 164.56             | 43.39    | 109.52            | 1,342.54                  |
| Min  | 0.00              | 0.00               | 0.00     | 0.00              | 903.89                    | 0.00              | 0.00               | 16.44    | 35.92             | 590.74                    |
| SD   | 5.40              | 22.62              | 16.21    | 33.75             | 220.39                    | 20.73             | 34.72              | 7.51     | 18.01             | 220.68                    |
| Obs  | 37                | 37                 | 37       | 37                | 37                        | 37                | 37                 | 37       | 37                | 37                        |

# Appendix 3: Descriptive statistics (continued)



**Appendix 4: Tests for Existence of Thresholds** 

C: Trade openness and private credit



Benin: A: Exports and private credit



C: Trade openness and private credit



B: Exports and domestic credit



D: Trade openness and domestic credit





D: Trade openness and domestic credit



### Burkina Faso:

# A: Exports and private credit













C: Trade openness and private credit





D: Trade openness and domestic credit



### Cameroon:





## Central African Republic





C: Trade openness and private credit









### B: Exports and domestic credit



D: Trade openness and domestic credit



### Chad:







B: Exports and domestic credit









C: Trade openness and private credit

D: Trade openness and domestic credit



Cote D' Ivoire:

### A: Exports and private credit

B: Exports and domestic credit



### C: Trade openness and private credit





D: Trade openness and domestic credit



Gabon:



C: Trade openness and private credit



Egypt



C: Trade openness and private credit



Kenya:





Malawi:



D: Trade openness and domestic credit



Mali:

### A: Exports and private credit



F Test for Threshold Reject Linearity if F Sequence Exceeds Critical Value

### B: Exports and domestic credit



### Morocco:







Rwanda:



B: Exports and domestic credit



D: Trade openness and domestic credit

Senegal:



C: Trade openness and private credit





D: Trade openness and domestic credit



Sudan:

### A: Exports and private credit



### D: Trade openness and domestic credit



### Togo:

### A: Exports and private credit



C: Trade openness and private credit





D: Trade openness and domestic credit



Tunisia:











D: Trade openness and domestic credit



### **Appendix 5: Confidence Intervals for Threshold Effects**

Algeria:



C: Trade openness and private credit



### Benin:

### A: Exports and private credit



### C: Trade openness and private credit



### B: Exports and domestic credit



D: Trade openness and domestic credit





D: Trade openness and domestic credit



### Burkina Faso:

### A: Exports and private credit







### Burundi:

### A: Exports and private credit



B: Exports and domestic credit



D: Trade openness and domestic credit





### Cameroon:

A: Exports and private credit



### Central African Republic

A: Exports and private credit



### C: Trade openness and private credit









Chad:





### B: Exports and domestic credit



### D: Trade openness and domestic credit



### Congo Republic:

### A: Exports and domestic credit



### B: Trade openness and domestic credit



### Cote D'Ivoire:

### A: Exports and private credit



# Confidence Interval Construction for Threshold

### Egypt:

### A: Exports and private credit



### B: Exports and domestic credit



### D: Trade openness and domestic credit



### B: Trade openness and private credit



Gabon:



B: Trade openness and private credit



### Kenya:

### A: Exports and private credit



Malawi:

### A: Exports and private credit





### B: Exports and domestic credit



### B: Exports domestic credit



### Mali:

### A: Exports and private credit



C: Trade openness and private credit



Morocco:

### A: Exports and domestic credit



### Rwanda:

### A: Exports and private credit



### B: Trade openness and domestic credit





Senegal:



# C: Trade openness and private credit

LR(Gamma)

95% Critical

### Sudan:

### A: Exports and private credit



B: Exports and domestic credit



### D: Trade openness and domestic credit



### B: Trade openness and private credit



198



### A: Exports and private credit









LR(Gamma)

95% Critical

D: Trade openness and domestic credit



### Tunisia:

### A: Exports and private credit



### C: Trade openness and private credit



### B: Trade openness and private credit

