THE REPUBLIC OF TURKEY
ERCİYES UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

EXTERNAL SHOCKS AND MACROECONOMIC POLICIES IN AFRICA

By
Yacouba KASSOURI

Supervisor
Prof. Dr. Halil ALTINTAŞ

PhD Thesis

October 2020
KAYSERI

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EXTERNAL SHOCKS AND MACROECONOMIC POLICIES IN AFRICA

Yacouba KASSOURI

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ABSTRACT

Majority of sub-Saharan African countries depend on export revenues from fewer commodities as their main income generating activity. In this sense, some analysts argue that the impressive macroeconomic performance recorded in these countries over the past decades was triggered by the long commodity price booms and the strong capital inflows that accompanied it. This phenomenon known as the ‘‘commodity super-cycle’’ was only interrupted by the recent global financial crisis when the global economy slowed down, generating significant swings of the commodity terms of trade for many commodity-exporting countries. Thus, the end of the so-called commodity super-cycle has generated major macroeconomic challenges in recent years, particularly in sub-Saharan Africa. From the perspective of commodity-exporting countries, unstable terms of trade and primary commodity prices complicate their macroeconomic management and exacerbate their vulnerability to commodity price shocks.

The objective of this dissertation is to assess the effects of external shocks mediated through terms of trade and primary commodity prices on macroeconomic policies through change in the financial sector, real exchange rate and fiscal policy. This thesis exploits technically sophisticated econometric techniques to examine appropriate macroeconomic policy responses to the terms of trade and commodity price fluctuations. The study specifically uses panel smooth transition regression model, dynamic panel threshold approach, nonlinear panel autoregressive distributed lag, and the interactive fixed effects models. These econometric approaches effectively deal with several econometric shortcomings neglected in previous studies such as cross-sectional dependence, cross-country heterogeneity, endogeneity, nonlinearity, threshold effect, and time-varying heterogeneity. The analyses also focus on a large sample of various commodity-exporting countries in sub-Saharan Africa. In this light, this dissertation contributes to theoretical and empirical studies in macroeconomics, with a focus on evaluating relevant policies to

provide new insights into questions related to financial development, exchange rates and fiscal policy in resource rich countries.

The dissertation provides evidence in favor of the financial resource hypothesis in oil-exporting countries conditional to the degree of democratic accountability. The results also illustrate that primary commodity prices are a fundamental trigger of real exchange rate dynamics in commodity-exporting countries. Specifically, it's shown that the response of real exchange rate to terms of trade shocks is asymmetric. That's, the real appreciation is more pronounced for positive than negative shocks in terms of trade in the long-run while negative shocks in terms of trade cause the real effective exchange rates to depreciate in the short-run. In addition, the asymmetric responses of real exchange rates differ across commodity subgroups and seem to matter more for energy-exporting countries. Finally, the study demonstrates the pro-cyclicality of fiscal policy with respect to the terms of trade cycles. This policy failure is explained by the adoption of fixed exchange rate regimes. Finally, the study identifies a tendency for more pronounced pro-cyclical fiscal policy among extractive commodity-exporting countries.

Key-words: Financial development; Commodity currencies; Fiscal policy cyclicality; External shocks, Macroeconomic policies.

AFRİKA'DAKİ DIŞSAL ŞOKLAR VE MAKROEKONOMİK POLİTİKALAR

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Erciyes Üniversitesi Sosyal Bilimler Enstitüsü, Doktora Tezi, Ekim 2020

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ÖZET

Sahra altı Afrika ülkelerinin büyük çoğunluğunun gelir getiren ana faaliyetleri belirli emtialardan elde edilen ihracat gelirlerinden meydana gelmektedir. Bu anlamda bazı araştırmacılar, son on yılda bu ülkelerde kaydedilen etkileyici makroekonomik performansın, uzun süren emtia fiyat artışlarından ve ona eşlik eden güçlü sermaye girişleri tarafından tetiklendiğini savunmaktadırlar. Emtia süper döngüsü olarak bilinen bu olgu, küresel ekonominin yavaşlamasıyla birçok emtia ihraç eden ülke için emtia ticaret hadlerinin önemli dalgalanmalarına neden olan son küresel mali kriz tarafından kesintiye uğramıştır. Bunun sonucunda son yıllarda emtia süper döngüsü sona ermiş ve özellikle Sahra altı Afrika'da büyük makroekonomik zorluklar yaşanmıştır. Emtia ihraç eden ülkeler açısından bakıldığında, değişken ticaret hadleri ve istikrarsız emtia fiyatları makroekonomi yönetimini zorlaştırmakta ve bu ülkelerin emtia fiyat şoklarına karşı kırılganlıklarını artırmaktadır.

Bu tezin amacı, ticaret hadlerinin ve birincil emtia fiyatlarının aracılık ettiği dışsal şokların finansal sektörde, reel döviz kurunda ve maliye politikasında meydana getirdiği değişimlerin makroekonomik politika üzerindeki etkilerini değerlendirmektir. Bu çalışmada, ticaret hadlerindeki ve emtia fiyatlarındaki dalgalanmalara verilen makroekonomik politika tepkilerini incelemek için teknik açıdan gelişmiş ekonometrik yöntemlerden faydalanılacaktır. Bu yöntemler; yumuşak geçişli panel regresyon modeli, dinamik panel eşik yaklaşımı, doğrusal olmayan panel otoregresif dağıtılmış gecikme modeli ve etkileşimli sabit efektler modeli olarak belirlenmiştir. Bu ekonometrik yaklaşımlar, gibi önceki çalışmalarda yer alan yatay kesit bağımlılığı, ülkeler arası heterojenlik, endojenlik, doğrusal olmama, eşik etkisi ve zamanla değişen heterojenlik çeşitli ekonometrik eksikliklerin önemli şekilde giderilmesini sağlayacaktır. Çalışmada Sahra altı Afrika'da emtia ihraç eden çeşitli ülkelerden büyük bir örneklem alınmaktadır. Bu bağlamda çalışma, kaynak zengin ülkelerdeki finansal kalkınma, döviz kuru ve maliye

politikası ile ilgili sorulara yeni bakış açıları sağlamayı hedefleyen politikaların değerlendirilmesine odaklanarak, makroekonomi alanındaki teorik ve ampirik çalışmalara katkıda bulunmayı amaçlamaktadır.

Çalışmada, petrol ihraç eden ülkelerde demokratik hesap verebilirlik derecesiyle açıklanan finansal kaynak hipotezi lehine kanıt sunulmaktadır. Sonuçlar ayrıca, birincil emtia fiyatlarının emtia ihraç eden ülkelerde reel döviz kuru dinamiklerinin temel tetikleyicisi olduğunu göstermektedir. Sonuçlar spesifik olarak, reel döviz kurunun ticaret şoklarına olan tepkisinin asimetrik olduğunu göstermektedir. Reel değerlendirmeye göre kısa vadede ticaret hadlerindeki negatif şoklar, reel efektif döviz kurunun değer kaybetmesine neden olurken uzun vadede bu negatif şoklar olumlu sonuç göstermektedir. Buna ek olarak, reel döviz kurunun asimetrik tepkileri emtia alt gruplarında farklılık göstermektedir ve enerji ihraç eden ülkeler için daha önemli görülmektedir. Son olarak çalışmada maliye politikasının döngüselliği ticaret döngüleri açısından incelenecek ve politika başarısızlıkları katı döviz kuru rejimleri açısından açıklanacaktır. Ek olarak emtia ihraç eden ülkeler arasında daha belirgin bir döngüsel mali politika eğilimi görülmektedir.

Anathar Kelimeler: Finansal gelişme, Emtia para birimleri, Maliye politikasının döngüselliği, Dışsal şoklar, Makroekonomik politikaları.

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ABBREVIATIONS

AMG : Augmented Mean Group

ARDL : Autoregressive Distributed Lag

BP : Band-Pass Filter

CADF : Cross-Sectionally Augmented Dickey-Fuller

CEC : Commodity-Exporting Countries

CFA : Communaute Financiere D'Afrique

CIPS : Cross-Sectionally Im Pesaran Smith

CSD : Cross-Sectional Dependence

CTOT : Commodity Terms of Trade

DD : Dutch Disease

DGP : Data Generating Process

DPTRM : Dynamic Panel Threshold Regression Model

DSGE : Dynamic Stochastic General Equilibrium

FRC : Financial Resource Curse

FD : Financial Development

GDP : Gross Domestic Product

GMM : Generalized Method of Moments

HP : Hodrick-Prescot filter

HIPC : Heavily Indebted Poor country

IFE : Interactive Fixed Effects

IV : Instrumental Variables

LM : Lagrange Multiplier

NLLS : Nonlinear Least Squares Estimators

NOC : National Oil Companies

PCP : Primary Commodity Prices

PPP : Purchasing Power Parity

PSTRM : Panel Smooth Transition Regression Model

RBE : Resource-Based Economies

RER : Real Effective Exchange Rate

RQ : Research Question

SDG : Sustainable Development Goal

SSA : sub-Saharan Africa

SOC : State-Owned Companies

UNCTAD : United Nations Conference on Trade and Development

VAR : Vector Auto-regressive

2SLS : Two-Stage Least Square

INTRODUCTION

Within the last decade or so, commodity markets have been battered by two fundamental changes, giving a new impetus to academics and policymakers devoted to the analysis of the macroeconomic implications of such transformations. One of these stark transformations is the upsurge in world commodity prices or a super price cycle, which was only interrupted by the recent global financial crisis when the global economic slowdown. Another fundamental change is the large rise in the popularity of financial market participants in commodity assets as an exotic asset class in hedging decisions and risk diversification strategies. This phenomenon is known as the financialization of commodity markets, together with the end of the super price cycle have exerted violent fluctuations in the dynamics of the commodity terms of trade (CTOT) in countries predominantly dependent on primary commodities.

From the perspective of commodity-dependent low-income countries, unstable CTOT and primary commodity prices (PCP) complicate their macroeconomic management and exacerbate their vulnerability to commodity price shocks (Agarwal, Duttagupta, & Presbitero, 2018; Hove, Touna Mama, & Tchana Tchana, 2015; Raddatz, 2007). For these countries, the challenge ahead is to accommodate the volatility and persistence of these shocks to stabilize financial markets and minimize the degree of fiscal policy pro-cyclicality in order to cope with the resource curse mechanism. At the current juncture, two dilemmas have to be addressed by policymakers in commodity-exporting emerging and developing markets. The first is how to manage resource revenues to avoid a systemic curse in fiscal stances and the financial sector, and the second challenge is how to reduce the vulnerability of exchange rates to external shocks.

Concerning the first question, it is well established in the literature that the financial sector is an important vehicle for the transmission of external shocks to the real economy in an

environment of limited financial depth (Beck, 2012). As a consequence, depending on its magnitude, the transmission of global shocks through the financial sector has several effects on the real economy in commodity-exporting low-income countries, where the financial sector is a vital engine for small business growth and entrepreneurship and can have important economic diversification implications through the creation of jobs, poverty reduction, and macroeconomic stability (Banerjee & Duflo, 2014; Demirguc-Kunt & Levine, 2009). With this background, the decision as to which policy tools are needed to alleviate the resource curse in the financial system will depend on the institutional environment in RBE. Several hypotheses including lack of good institutions, mismanagement of resource rents, rent-seeking behavior are essential for explaining the financial backwardness in RBE (Bhattacharyya & Hodler, 2014; Kinda, Mlachila, & Ouedraogo, 2016). A better understanding of the intermediate role of political institutions in the transmission of international commodity prices to the financial sector is a challenging and important task to alleviate the resource curse in financial development.

Another line of research related to the resource curse paradox is the poor management of fiscal policy during episodes of boom and bust in CTOT. As reported by several analysts, low-income commodity-exporting countries tend to exhibit pro-cyclical fiscal policies as the government tends to overspend during episodes of terms of trade improvements and cut spending during episodes of the terms of trade deterioration (Kaminsky, Reinhart, & Végh, 2004; Ndikumana & Abderrahim, 2010). Thus, the cyclical behavior of fiscal policy in light to changes in the terms of trade poses an important challenge for macroeconomic stability in commodity-exporting countries (CECs), as fiscal policy is an essential stabilization instrument available to smooth business cycle fluctuations (Brück & Zwiener, 2006; Clancy, Jacquinot, & Lozej, 2016). In this connection, evidence suggests that developing CECs tend to follow highly pro-cyclical fiscal policy patterns, that is, they raise (lower) spending and lower (raise) tax rates during episodes of terms of trade improvement (deterioration). Such a fiscal policy pattern would exacerbate fiscal deficit in bad times which in turn may delay growth prospects in the medium-term. Accordingly, good fiscal management is that fiscal policy should be counter-cyclical to minimize the effects of adverse terms of trade shocks on fiscal performance. For small economies dependent on commodities, fluctuations in the terms of trade can complicate fiscal policy, making it difficult to determine a sustainable level of public spending and

fiscal revenues. The challenge is, even more, pressing for primary CECs encounter highly volatile government revenue due to volatile CTOT.

The second question concerns the responses of the real effective exchange rate (RER) with respect to CTOT and PCP shocks. Understanding the dynamic of the RER remains a key issue in the open economy research agenda since the influential works of Chen and Rogoff (2003) and Cashin et al. (2004). PCP booms and busts pose complex challenges for the determination of the long rate at which RER adjusts to ensure the equilibrium of the macroeconomic system (Ricci et al. 2013). This has been true for net commodity-exporting countries in which their currencies have been shown to closely track the dynamics of primary commodity prices, in such a way that they are known as commodity currencies on foreign exchange markets (Cashin et al. 2004; Chen and Rogoff, 2003; Coudert et al. 2015). The commodity currency denomination implies that uncertainties from commodity markets could be associated with currency collapses in countries heavily dependent on the exports of commodities.

This thesis is concerned with the role of external shocks mediated through the CTOT and PCP in driving macroeconomic policies in SSA countries. Specifically, the objectives of the thesis are threefold. Firstly, it examines a new variant of the resource curse hypothesis stemming from the financial system by accounting for the intermediating role of political institutions (and in particular democratic accountability) in a large sample of oil-based economies. The motivation for investigating the oil price-financial development-institutions nexus lies on two points: (i) emerging and developing oil-producing/exporting countries suffer from weak levels of financial depth and key macroeconomic indicators in these countries display higher oil price dependency; (ii) lack of consensus and gaps in the literature regarding the resource curse paradox.

Secondly, this dissertation expands the commodity currencies theory developed by Chen and Rogoff (2003) and Cashin et al. (2004) to low-income resource-based economies highly dependent on the exports of different types of commodities by examining the responses of RERs to CTOT and PCP shocks. Lastly, this thesis aims at analyzing the issues of fiscal pro-cyclicality with respect to the terms of trade cycle in SSA countries. For that aim, we explore the response of fiscal stances (public spending & revenue) to the terms of trade cycles. To accomplish this goal, we employ panel time-series estimation

approaches and account for the additive individual effects and the time-varying interactive effects. These effects are particularly important in our application to the cyclical behavior of fiscal policy, where the unobserved preference of policymakers in terms of spending decision is likely to manifest itself differently over the terms of trade cycle. Estimators ignoring the time-varying feature of unobservable cross-sectional heterogeneities may lead to seriously biased parameters and estimates. Furthermore, we discuss the potential role of openness (financial versus trade openness) and alternative exchange rate regimes (fixed versus flexible regimes) in shaping the degree of fiscal policy cyclicality with respect to the terms of trade cycle in SSA countries. To increase the policy relevance of this study, we account for heterogeneity across extractive and non-extractive CECs. Such decomposition allows us to assess whether the degree of fiscal cyclicality is commodity type-dependent or not.

Therefore, this thesis provides new insights into the effects of external shocks transmitted through CTOT and PCP shocks on macroeconomic policies in CEC and makes both theoretical and empirical contributions to the existing literature. This thesis is related to the large literature that explores the resource curse paradox in resource-based economies (D. Adams, Ullah, Akhtar, Adams, & Saidi, 2019; Mehlum, Moene, & Torvik, 2006; Rodrïguez & Sachs, 1999; Sachs & Warner, 1995). Unlike previous studies concentrating on the effects of resource rents on macroeconomic indicators such as economic growth, unemployment, investment and political institutions (Auty, 2001; Badeeb, Lean, & Smyth, 2016; Damette & Seghir, 2018; Robinson, Torvik, & Verdier, 2006; Torvik, 2002; Van Der Ploeg, 2011), this study expands on the influential papers of Beck (2012) and Bhattacharyya and Hodler (2014) by accounting for the role of democracy in the oil price-financial development nexus. Second, an initial drawback related with the previous studies is that they introduce nonlinearity by specifying an interactive variable in a linear framework (Beck, 2012; Beck & Poelhekke, 2017; Kinda et al., 2016; Mlachila & Ouedraogo, 2019), our estimates follow a non-linear process and smoothly switch across regimes. Specifically, we employ various threshold models to explore the threshold effect of democracy on the interaction between oil price fluctuations and the development of the financial sector.

Furthermore, we follow the asymmetric modeling approach to investigate the linkages between CTOT, PCP, and the RER using panel time-series data for African economies.

Specifically, we employ the nonlinear panel ARDL to investigate the responses of RER to positive and negative shocks in CTOT and PCP. This thesis builds on Gruss and Kebhaj (2019) by using updated data of CTOT data set to investigate the way in which shocks to terms of trade influence RER in periphery countries. This dataset offers a comprehensive measure of TOT indices based on the time-varying weights of up to 45 individual commodities. While such a measure of CTOT allows for nonlinearity, it avoids the econometric pitfalls associated with the possible endogeneity of commodity terms of trade which may lead to feedback effects of the RER on CTOT. Some authors assumed that terms of trade are endogenous and explored the effects of RER on CTOT (Belasen and Demirer, 2019; Clements and Fry, 2008; Swift, 2004). However, the argument in favor of the feedback effect of the real exchange rate on world markets may not be entirely valid in our sample of African economies since it implies that these economies are large enough to individually affect the world market, which is hard to validate in the African context. Besides, we extend our analysis to several categories of primary commodities to consider the eventual heterogeneity across countries in their response to commodity market dynamics. To this end, we subdivide the whole sample into four subsamples including agricultural and raw material, energy, food and beverages, and metals. In doing so, we question whether the commodity currency hypothesis is commodity type-dependent or not.

Lately, this thesis provides an explicit analysis of the cyclical behavior of fiscal variables in response to terms of trade cycle within a comparative framework, and with a consideration of the exchange rate regimes and the degree of financial and trade openness in SSA countries. Understanding the cyclical dynamics of fiscal policy is very important for various reasons. (i) this type of study can make a valuable contribution to the design of optimal stabilization fiscal policy. (ii) CTOT shocks may be a contributory factor to the emergence of fiscal imbalances, (iii) regarding the source of the shift in CTOT, fiscal policy may have a role to play in the internal and external adjustment process. (iii) this issue is so important that recently, many West African leaders highlight the necessity of moving towards a more flexible single currency namely ECO across ECOWAS countries.

This Ph.D. thesis is structured around 7 chapters, comprising a series of reviews and empirical studies analyzing the resource curse hypothesis. The first chapter discusses the key concepts used in this thesis. This chapter provides a detailed description of key

concepts and discusses their relevance in the current literature. In the second chapter, we emphasize the stylized facts of macroeconomic policies in sub-Saharan Africa countries. Thus, the first & second chapters provide a clear picture of macroeconomic policies in emerging and developing countries subject to terms of trade and commodity price shocks.

The third chapter discusses alternative theoretical explanations brought to explain the macroeconomic performance in CECs. In this chapter, we examine different theoretical conceptions and explanations of several issues including the financial resource curse paradox, the commodity currency hypothesis, and the pro-cyclical behavior of fiscal policy. The fourth chapter underlines the salient features of the empirical literature. Throughout this chapter, we provide a brief sketch of prominent characteristics of the literature on the effects of external shocks on macroeconomic policies. In chapter five, we present the data set, models, and the methodology of empirical studies of the thesis. We begin with a detailed description of data sources and variable definitions. We then present the models subject to empirical estimations and present the empirical methodologies employed in the estimations, briefly. Broadly speaking, there are four estimation approaches used in this thesis, notably the panel smooth transition regression model (PSTRM), the dynamic panel threshold regression model (DPTRM), nonlinear panel ARDL model (NPARDL) and the interactive fixed effects model (IFE).

In chapter six, we summarize the overall empirical findings from our estimation approaches. Throughout this chapter, we report the overall findings of the simulation and discuss the available empirical evidence with a special emphasis on their implications for policy design. The last chapter (chapter 7) concludes the thesis and gives directions for further research.

CHAPTER 1

DEFINITION AND KEY FEATURES OF MAJOR CONCEPTS

1.1. Natural Resources

Natural resources are a component of the environmental setting that is scarce and indispensable in the consumption and production process, either in the raw state or after some transformation. From an economic point of view, the following characteristics are common to all of the natural resources: price volatilities, exhaustibility, externalities, uneven repartition across countries, and the predominance of natural resources in GDP. In the following subsection, we examine each of these features in detail.

1.1.1. Price Volatilities

The last feature of natural resources examined is their extreme price volatility. This has been observed for minerals and metals, which have fluctuated dramatically in recent years. Price volatility for soft commodities such as agriculture and food is much less than for other types of natural resources. According to IMF statistics, fuel prices increased by 234 percent over the period 2003-08, while mining products increased by 178 percent. Over the same period, forest and fisheries products prices increased at relatively modest rates of 38 percent and 26 percent, respectively. Several factors have been advanced to explain these large fluctuations in oil prices, including geopolitical uncertainty, changes in demand and speculation, supply shocks (Kilian, 2009).

1.1.2. Exhaustibility

In RBE, natural resources are classified based on their renewability.[1] A renewable resource is a resource that is replaced naturally or renews itself in a very short time. Therefore, by considering the limitations of the resource's reproductive capacity in the extraction process, renewable resources have the potential to provide unlimited resources over a lifetime. Clearly, the timescale must be considered, as in principle some natural resources are renewable, but not in practice. For instance, it requires several hundred million years for the dead trees to turn into coal and oil (Armstrong & Blundell, 2007). Renewable resources include elements such as forests, fisheries, farming. However, it is noteworthy that renewable resources may also be exhaustible when they are overused. Non-renewable resources are finite and cannot be replaced by natural means at a level equal to their consumption over time. Thus, the amount of non-renewable resources declines for each unit consumed.

1.1.3. Externalities

An externality takes place whenever an economic agent's actions indirectly affect other agents either positively or negatively (Farzin, 1996). In other words, externality occurs when the outcomes of some operations (activities) inflict additional costs or generate external benefits for economic agents outside the relevant production or consumption process. These externalities can be positive or negative. In the case of natural resources, extraction, and use of resources can have a positive or negative effect on the allocation of resources. However, the economic problems related to negative externalities constitute the key agenda of the natural resource economics literature. For example, the combustion of fossil fuels results in a wide range of pollutants that directly harm human health, while emitting large quantities of carbon dioxide that contribute to global warming. Positive externality may occur when a multinational mining company constructs a road that allows nearby farmers to transport their goods to the market.

[1] The terms exhaustible and non-renewable are used interchangeably. It is worth noting that renewable resources may also be exhaustible if they are over-exploited.

1.1.4. Uneven Distribution Across Countries

A large amount of natural resources is unevenly distributed and clustered in a small number of countries. Thus, different regions have access to different renewable or non-renewable natural resources.[2] Some places are more endowed that others-for instance, some regions have lots of water, while others have lots of mineral and forestlands. Several factors such as trade liberalization and economic globalization can eliminate this kind of regional disparities in natural resource endowments by shifting resources from areas of excess supply to areas of excess demand, which may also facilitate their effective use (Benchekroun, Chaudhuri, & Tasneem, 2020).

1.1.5. Dominance of Natural Resources In National Economies

Another significant feature of natural resources is the prevailing position of this sector in many economies. The predominance of natural resources in exports is consistent with the predictions in trade theory that nations specialize in producing goods in which they have a comparative advantage and export them in exchange for other goods. Natural resources drive many national economies and are central to the livelihoods of the poor rural majority, yet they are a source of public revenue and national wealth. The resource curse seems to be more pronounced in some resource-rich countries such as Niger, while others are suffering from natural wealth (Norway).

1.2. Resource Abundance versus Resource dependence

There are disagreements among economists on the appropriate indicator of natural resources in empirical studies (Brunnschweiler & Bulte, 2008). To appreciate our argument, it is crucial to understand the proxy used to measure both concepts in the literature on resource economics. A common measure of resource abundance is the ratio of resource exports to GDP, generally based on the information for a given period. As discussed in (Cockx & Francken, 2014; Wegenast & Schneider, 2017), this ratio is a measure of resource dependence rather than of resource abundance. Such a measure is subject to some endogeneity issues as the denominator is sensitive to the scale of

[2] For example, nearly 90% of the worlds proved oil reserves are located in just 15 countries (out of slightly more than 200 in the world today).

economic activity and the institutional framework in the resource sectors. For this reason, the resource dependence ratio should not be treated as an exogenous explanatory variable in growth regressions (Wright & Czelusta, 2004). A more meaningful measure of resource abundance would reflect resource stocks, rather than the current economic (income) flows derived from them, which is known as resource rents. In this light, some authors reveal that resource abundance has a positive correlation with growth and institutional quality, while resource dependence tends to have a weak/negative relationship with growth (Atkinson & Hamilton, 2003; Brunnschweiler & Bulte, 2008; Magnus, Ji, & Wang, 2012).

1.3. External Shocks

In this thesis, we define several types of external shocks in order to quantify their respective impact on macroeconomic indicators in CECs. The external shock is considered as a simultaneous combination of supply and demand external shocks. It relates to shifts in global markets typically outside the influence of individual countries. Policymakers in CECs, whose economic welfare is heavily dependent on world commodity prices, will be interested in having more real-time assessments of the CTOT and PCP shocks on their economy. Consequently, in this thesis, we focus on external shocks mediated through TOT and PCP. Given the large terms of trade and primary commodity shocks hitting developing commodity-exporting countries, it is critical to assess the implications of these shocks for the stability of macroeconomic indicators.

1.4. The Macroeconomics Of The Dutch Disease

The Dutch Disease can be seen as an example of the pro-cyclicality of macroeconomic indicators characterized by a boom in government spending, construction, and other non-traded goods and services, stemming from large, but perhaps temporary, improvements in the terms of trade. Some representative symptoms are as follows:

(i) a large appreciation in the currency occurring in the form of a nominal currency appreciation in the case of countries with a floating exchange rate or the form of foreign currency inflows and inflation in countries with a fixed exchange rate.

(ii) an increase in public spending in response to the increased availability of tax receipts or royalties

(iii) an increase in the price of nontraded goods (goods and services such as housing that are not internationally traded), relative to traded goods (other internationally traded goods other than the export commodity).

(iv) a shift of production factors including labor, capital, and land out of non-export-commodity traded goods due to the more attractive returns in the export commodity sector.

(v) a current account deficit resulting in an international debt that may be difficult to service when the commodity boom ends.

CHAPTER 2

SOME STYLIZED FACTS OF MACROECONOMIC INDICATORS IN SUB-SAHARAN AFRICAN COUNTRIES

2.1. Exchange Rate Policies

2.1.1. Exchange Rate Regimes in Africa

Exchange rate policy plays an important role in shaping macroeconomic indicators in countries highly dependent on the exports of primary commodities. Given their higher reliance on primary commodities, most African economies have been implementing exchange rate policy reforms based on the validity of the PPP hypothesis. The PPP hypothesis holds that the exchange rates between two currencies are determined in equilibrium by the relative price ratio of the two countries, suggesting that the RER is constant when the PPP relation holds. Thus, any movements in real exchange rates reflect short-run deviations (such as real depreciation) will result in capital movements that tend to equilibrate trade flows and shift exchange rate towards its long-run equilibrium level suggested by the PPP relation.

While there is a widespread consensus on the theoretical benchmark of the PPP hypothesis for exchange rate determination and exchange rate policy reform, the recent commodity price booms have caused serious disequilibria in the real exchange rate and led to the so-called Dutch Disease phenomenon. Movements in capital flows triggered by the CTOT and PCP shocks are key determinants of the real exchange rate through their influence on the demand/supply of foreign currencies. In most SSA countries, the exports of primary commodities remain the main provider of foreign exchange. However, in an environment characterized by persistent terms of trade and commodity price shocks, the regulation of foreign exchanges to a level compatible with sustainable economic

development is one of the key macroeconomic challenges faced by African central banks. One the one hand, it is argued that episodes of foreign exchange inflows accompanied by commodity price booms cause a RER appreciation, which would decrease the international competitiveness and shift resources from non-tradable to the tradable sector. On the other hand, the decline in foreign exchanges observed during slowdown changes in commodity prices would imply a real depreciation, leading to a significant increase in international competitiveness. In either case, policymakers need to set a competitive and stable exchange rate able to bring the economy to its level of full employment (Bailliu, Lafrance, & Perrault, 2003; Céspedes, Chang, & Velasco, 2004; Chang & Velasco, 2000).

From the policy circle, the exchange rate policy operates at two levels (Elbadawi, Kaltani, & Soto, 2012). Firstly, the choice of exchange rate regime. The implications of alternative exchange regimes remain one of the debatable topics in international economics. On the one hand, there is a fixed exchange rate regime that allows countries to fix their exchange rate with institutional arrangements to make sure it stays fixed like CFA zone in SSA (Cottani, Cavallo, & Khan, 1990; Ghura & Grennes, 1993). One the other hand, countries may adopt a more flexible arrangement to allow their rate to float. Secondly, the exchange rate policy is concerned with discretionary choices given the regime. Based on the underlying regime, there are two non-discretionary choices. The first is a pure flexible (or a regime of strict non-intervention). In such an environment, central banks anchor inflation to a domestic variable such as money supply. The second is concerned with the intervention in the foreign exchange market to keep the exchange rate to a specific target level, which itself becomes the anchor of the domestic inflation rate. Overall, African countries can be classified into two groups based on their exchange rate policies- the CFA zone and the non-CFA zone. The members of the CFA zone share a common currency, the franc CFA, that is directly convertible with the euro through a set of monetary arrangements with France. The non-CFA countries followed a flexible exchange rate policy.

Despite these exchange rate options, many African countries (CFA and non-CFA) have experienced important exchange rate volatility ranging between 0.04% and 150% in 1973 and 2006, respectively (Alagidede & Ibrahim, 2017; Omojimite & Akpokodje, 2010). More importantly, the exchange rates of CFA countries tend to converge and follow a more discernible pattern in contrast with those of the non-CFA countries. In terms of

smoothing out external shocks, a flexible exchange rate regime has been advanced as the most appropriate regime to insulate the economy against real shocks (Friedman, 1953). It is documented that flexible regimes have quicker price adjustments to real shocks than do fixed regimes (Broda, 2004; Chia & Alba, 2006).

2.1.2. Terms of Trade and Real Exchange Rate Dynamics in Africa

We observe the direction of co-movements between each of the primary commodity price indices and RER in separate graphs as depicted in Figures 1 to 5. Three things are worth noting. As shown in Figure 1, there is a high degree of co-movement between RER and the commodity TOT index especially since the beginning of 2005 due, in great part, to the increasing presence of financial market participants on commodity markets at the beginning of 2005, which gives rise to the terms of financialization of commodity markets (Kilian & Murphy, 2014; Öztek & Öcal, 2017; Juan Carlos Reboredo, Rivera-Castro, & Zebende, 2014). This phenomenon was accentuated after the commodity crash at the end of 2008, we observe a stronger comovement between commodity terms of trade and real exchange rate over the period 2009 to 2014, which is considered as moderate market periods (Z. Adams & Glück, 2015). However, commodity terms of trade and real exchange rates exhibited an inverse co-movement over the subperiods from 2003 to 2005 and from 2014 to 2017. This provides graphical evidence of the presence of asymmetric co-movements between these series over the sample period. In Figure 2, we observe that the real exchange rate of agricultural and raw material exporters is relatively stable over the sample period. Similar trend is observed in Figure 3 for the real exchange rate of oil exporters. However, real energy commodity price index exhibited higher volatility compared to agricultural commodity prices, as depicted in Table 1. In Figure 4, we notice that real metal commodity price index and the real exchange rates co-move in the same direction starting from 2009, while an inverse comovement between the two series was obtained over the period from 2003 to 2006. All these support the argument of differential responses of metal exporting countries' RER to metal price shocks. In Figure 5, it is clearly observed that real food and beverage commodity price index and the RER of food and beverage exporters exhibit an upward trend over the sample period. Based on the visual inspection of real commodity price indices and RER, one may argue that the

response of the RER to primary commodity price shocks is more likely to vary between the four categories of primary commodity.

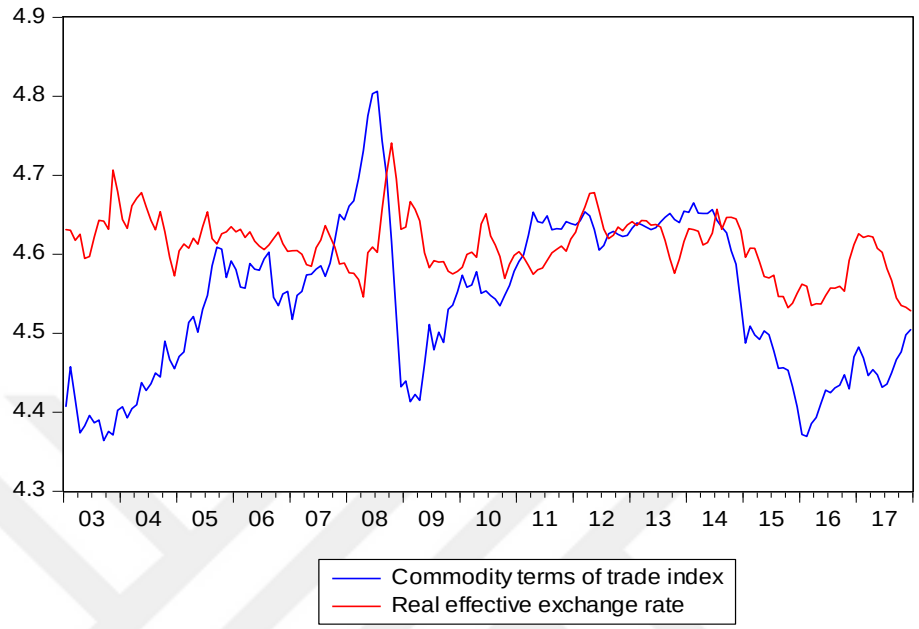

Figure 1. Commodity terms of trade index and RER nexus for the whole sample

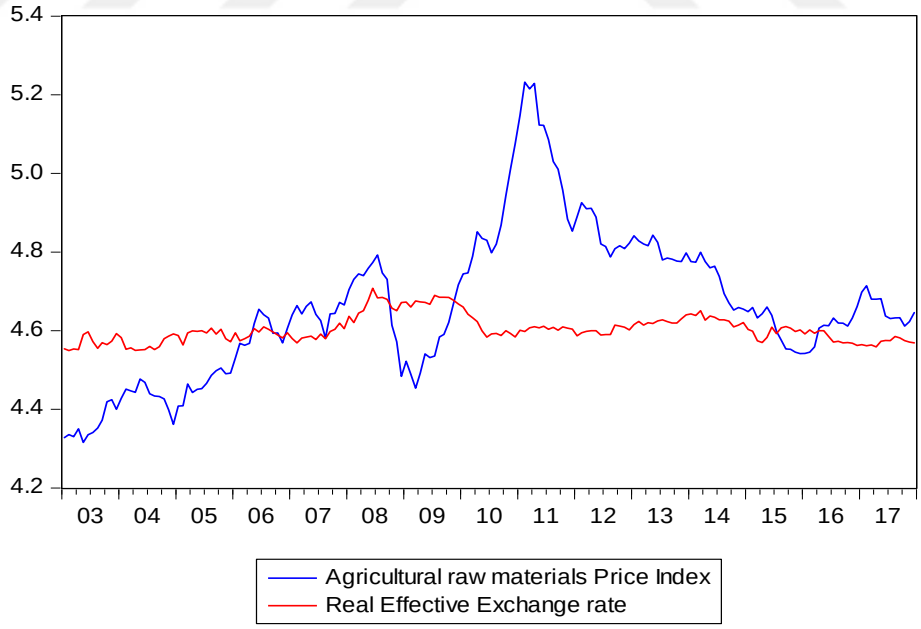

Figure 2. Real agricultural and raw materials commodity price index and RER nexus

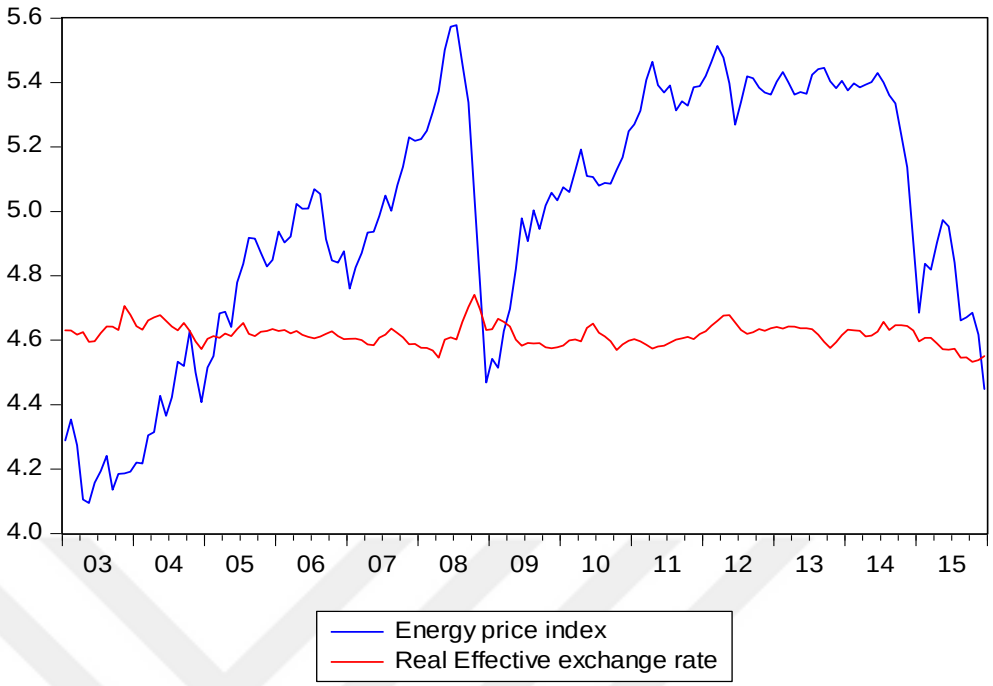

Figure 3. Real energy commodity price index and RER nexus

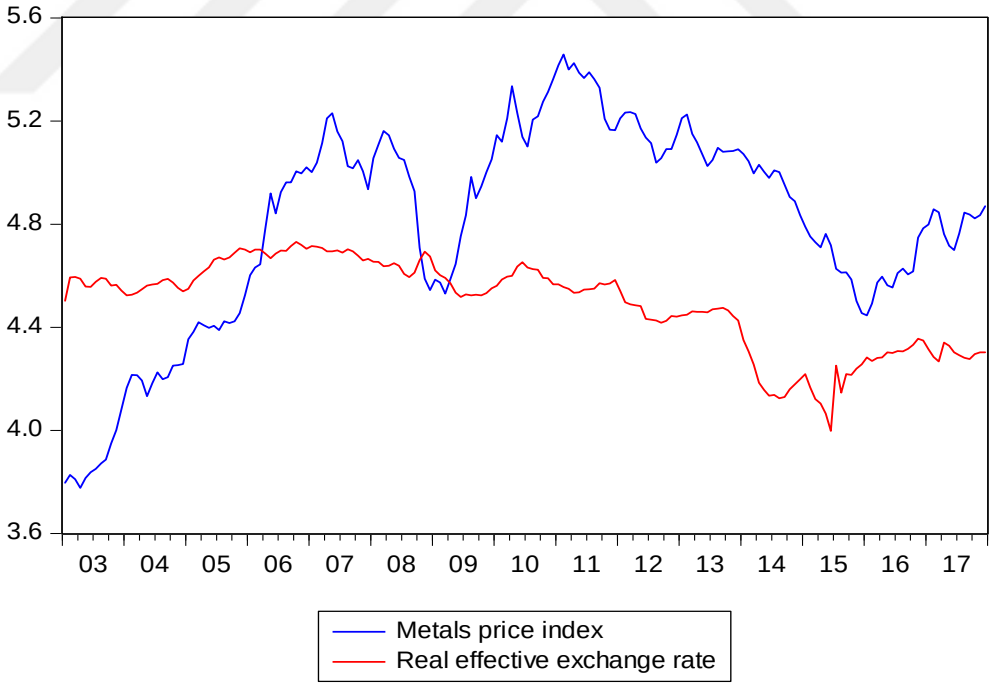

Figure 4. Real metal commodity price index and RER nexus

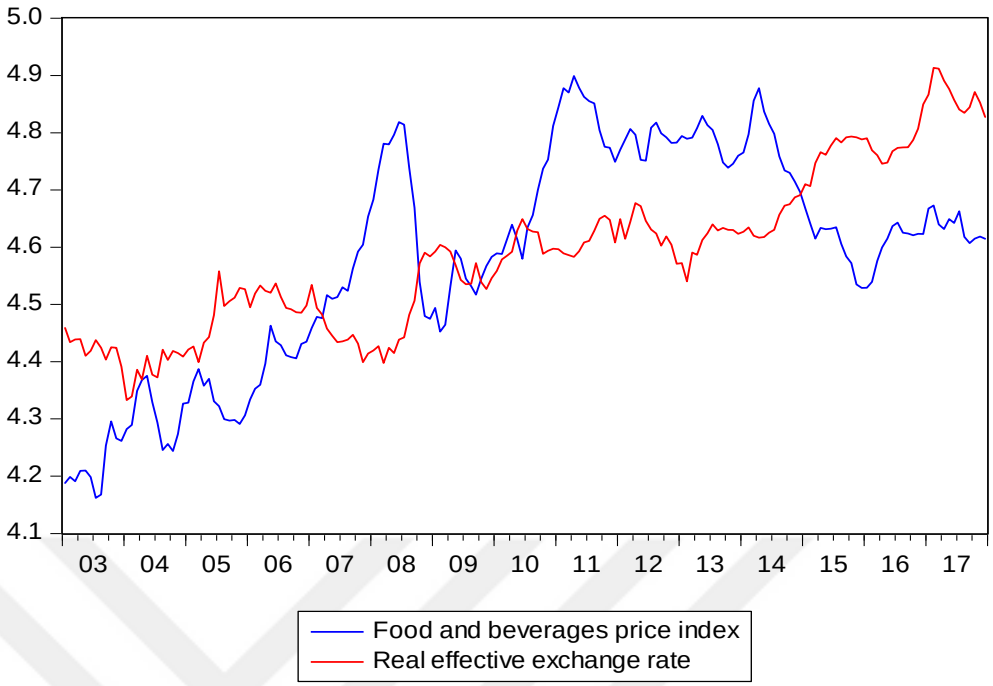

Figure 5. Real food and beverages commodity price index and RER nexus

2.2. Financial Sector Development and Oil Price fluctuations

Despite the extensive financial sector reforms observed in most emerging and developing countries over the last decades, their financial sectors remain vulnerable to foreign capital flows triggered by the CTOT and PCP shocks. The upswing movements in PCPs known as the super commodity price cycle have driven mainly external financial flows to emerging and developing markets. This surge in capital inflows together with several financial sector reforms such as financial liberalization and financial market integration has played a major role in shaping the financial sector in RBE. However, the financial system in major commodity-based economies remains under-developed and vulnerable to several external shocks, especially PCP volatilities and the terms of trade shocks (Agarwal et al., 2018; Kablan, Ftiti, & Guesmi, 2017; Masson, 2014).

As reported by several analysts, PCP and the CTOT shocks and the associated foreign capital inflows remain an important source of shocks for the financial sector in natural RBE (Brafu-Insaidoo & Biekpe, 2011; Gossel & Biekpe, 2017). For example, episodes of commodity price booms have been companied by excessive credit growth in the aggregate causing the problem of adverse selection and moral hazard, while banks tend to cut down the level of credits during episodes of a downward trend in primary

commodity prices. Thus, the financial sector in resource-rich economies tends to follow a pro-cyclical pattern, which may exacerbate credit expansion during good times and limit the levels of credits when commodity price slowdown. Such a pattern in the financial intermediation activities may lead to overheating of the economy and higher inflation (Masson, 2014). As recently shown by (Khandelwal, Miyajima, & Santos, 2016), the pro-cyclicality of the financial sector has been more pronounced in oil-exporting countries mainly due to their strong dependence on oil revenues. In the largest emerging and developing oil producers, namely Algeria, Angola, and Nigeria, oil represents more than 90% of exports in 2015 (World Bank, 2015). Thus, the volatility of the oil market aggravates fluctuations in bank lending with potential consequences for financial system stability. This underlines the importance to conduct sound macro-prudential policies to tackle the FRC, which is known as the negative correlation between dependence on oil revenue and financial sector performances in oil-exporting countries.

In the case of oil-exporting countries, the country has experienced significant capital inflows, with the volume increased from 20 billion USD in 1990 to above 120 billion USD in 2012, driven mainly by favorable oil prices. From that perspective, an important flow of '*hot money*' during oil price booms could amplify the vulnerability of the financial sector, especially in countries where the domestic banking system intermediates these flows through the supply of credit. Unfortunately, the bulk of the inflows have been traditionally volatile causing several macroeconomic challenges such as financial stability, capital controls, and exchange rate policy for these countries (Agarwal et al., 2018; Kinda et al., 2016). In many RBE, the sterilized intervention and capital controls have been proposed to mitigate financial vulnerability to commodity price shocks. Indeed, sterilized intervention and capital controls as policy tools have been widely used by central banks in emerging and developed market economies to purchases and sales foreign assets to shifts resource rents (or other such funds) from the domestic banking system to the central bank by increasing the levels of reserve requirements.

2.3. Overview of Fiscal Policy in Africa

2.3.1. Cyclicality of fiscal policy

The pro-cyclicality of fiscal policies has been documented to be one of the major policy failures in SSA countries. In most SSA countries adopt expansionary policies during

episodes of improvements in the terms of trade, therefore increasing government spending and/or decreasing taxation. This situation is said to be particularly acute in most SSA countries depending on the export of primary commodities. However, policymakers are likely to cut their public spending (and/or increase taxation) during episodes of the terms of trade deterioration. Several analysts have documented such a pattern of fiscal policy tends to amplify macroeconomic volatility and has not non-negligible welfare costs (Badinger, 2009; Carmignani, 2010; Pallage & Robe, 2003). This pro-cyclicality of fiscal policy has aggravated the influence of the terms of trade shocks on macroeconomic performance as fiscal policy appears to be the main channel through which changes in the terms of trade can influence economic growth, investment, and consumption (Checherita-Westphal & Rother, 2012; Masson, 2014). With this background, several commodity exporters have introduced fiscal rules or resource funds to mitigate the volatile effects of the terms of trade on fiscal policies.

Over the past decades, several emerging and developing markets have set fiscal rules in response to the pro-cyclical bias of fiscal policy (IMF, 2009). By enforcing strict constraints on fiscal management through numerical limits on budgetary aggregates, countries with fiscal rules tend to display fiscal prudence and reduce fiscal indiscipline. Among SSA countries, Botswana has introduced a debt limit at 20 percent of GDP. In addition, the country's fiscal framework includes some limits on the levels of government spending to 40 percent of GDP. The introduction of these fiscal rules have been successful and increased the credibility of fiscal policy in Bostwana. In most CECs that have introduced fiscal rules, the authorities have cut public spending but rarely as much as the revenue decline during the deterioration of the terms of trade. Given the key role of public spending in funding socio-economic programs, governments in lower-income countries faced important difficulties in adjusting their large public spending programs to lower revenues. This situation has created a dilemma in many CECs that have embarked on the adoption of the fiscal rule. It is important for policymakers to identify areas of public spending that can be varied over the course of the terms of the trade cycle in a way that cannot impede the efficiency of the spending.

Fiscal policy implementation in SSA countries is subject to a number of challenges. One of the major constraints is the narrow tax base which depends heavily on commodity export taxes and customs duties for government revenue and other indirect taxes such as

excise and sales taxes. At the same time, there is pressure to increase public expenditure mainly due to the socio-economic challenges fuelled by poverty, inequality, weak infrastructure, and rapid population growth. The implication of such a pattern of public spending implies that many SSA countries expanded the provision of economic and social services beyond their fiscal and administrative capacities, resulting in high budget deficits fuelled by the accumulation of external debt. Recently, the unsustainable levels of budget deficits and debt in many SSA economies have forced the adoption of the debt relief initiative such as the HIPC launched by the World Bank/IMF.

2.3.2. Fiscal Policy Cyclicality and Terms of Trade Cycles

To get a clearer image of the phenomenon that we are discussing here, there is a need to break down fiscal variables and terms of trade into cyclical components. In doing so, we plot the cyclical components of fiscal indicators and TOT for SSA countries. In the graphs below the cycles in the fiscal stance and the terms of trade are identified using the Hodrick-Prescott (HP) and the Band Pass (BP) filter techniques. These filters generate stationary cyclical deviations from trend, which can be used to explore the dynamic correlations among the cyclical component of fiscal policy and the cyclical component of the terms of trade. The HP filter by (Hodrick & Prescott, 1997) is a high-pass filter, which minimizes the variance of a series around a smoothing parameter (λ) that approaches a linear trend, subject to a penalty that constraints the second difference of the parameter. The penalty of the smoothing parameter is set based on the frequency of the data, for instance, for annual data $\lambda = 100$ and $\lambda = 14{,}400$ for monthly data. The BP filter technique proposed by (Christiano & Fitzgerald, 2003) is a random walk filter approximation, which is designed to accommodate both high and low frequencies noise in the cyclical component. In addition, the BP filter behaves well under asymmetry and nonstationarity in the data generating process of the series. For the BP filter, we set the minimum and maximum periodicities at 2 and 8 years, respectively. The authors believe that these filtering approaches are capable to estimate more reliable cyclical components of the underlying variables.

From the summary statistics Table A-1 (see Appendix A), we observed that the standard deviation of the cyclical component of government spending is larger than that of the cyclical components of the terms of trade and government revenue, irrespective of which

filter approach considered. This suggests that the cyclical component of government spending is more volatile than terms of trade and government revenue, an observation that is consistent with (Varvarigos, 2010). Irrespective of the filtering approach used, we report a positive and significant correlation between the cyclical component of government expenditure and the terms of trade cycle, although the estimated correlation coefficient between the cyclical component of government revenue and the terms of trade cycle is only significant when we used the BP-filter. Thus, one may claim that fiscal policy is significantly pro-cyclical with respect to the terms of trade in SSA countries over the period 1985-2017.

A number of interesting stylized facts arise from the graphical representation of the relationship between the cyclical components of government spending, tax revenues, and the terms of trades. First, the cyclical component of government spending is more volatile than government revenue, mostly because government spending is a policy tool used to overcome recessions. This is consistent with the higher standard deviation of government spending obtained previously.

Second, the cyclical components of government spending and the terms of trade display a positive comovement. A similar pattern is observed between the cyclical components of government revenues and terms of trades. This is because, during a CTOT deterioration when countries do not have access to the international financial market, it is difficult for the government to obtain funds from the financial market, which could drive down government spending. Moreover, the government is more likely to reduce public spending during episodes of terms of trade deterioration and increase spending during episodes of terms of trade improvements. Similarly, with a narrow tax base and a debt crisis looming for many SSA countries, terms of trade deterioration has negative consequences for revenue mobilization in the resource sector without diversification. However, the over-dependence on natural resource explains the strong co-movement between tax revenue performance and terms of trade fluctuations (Ndikumana & Abderrahim, 2010). Our graphical representation seems to suggest that fiscal stances are procyclical to terms of trade movements. This finding is consistent with the summary statistics discussed above. Thus, it is important to confirm this cyclicality behavior of fiscal policy with respect to terms of trade shocks from a more formal perspective using sophisticated econometric techniques.

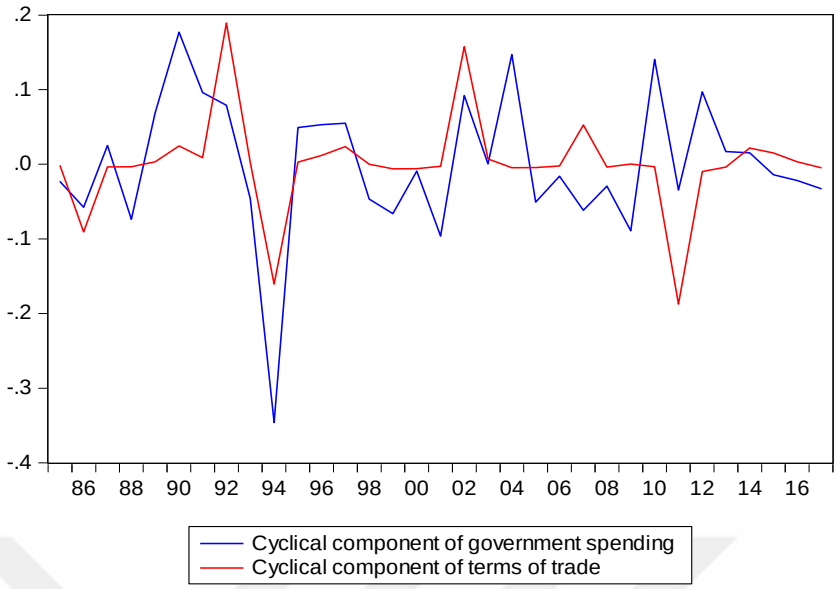

Figure 6. terms of trade, 1985-2017. Cyclical components are obtained by HP(100) filtering.

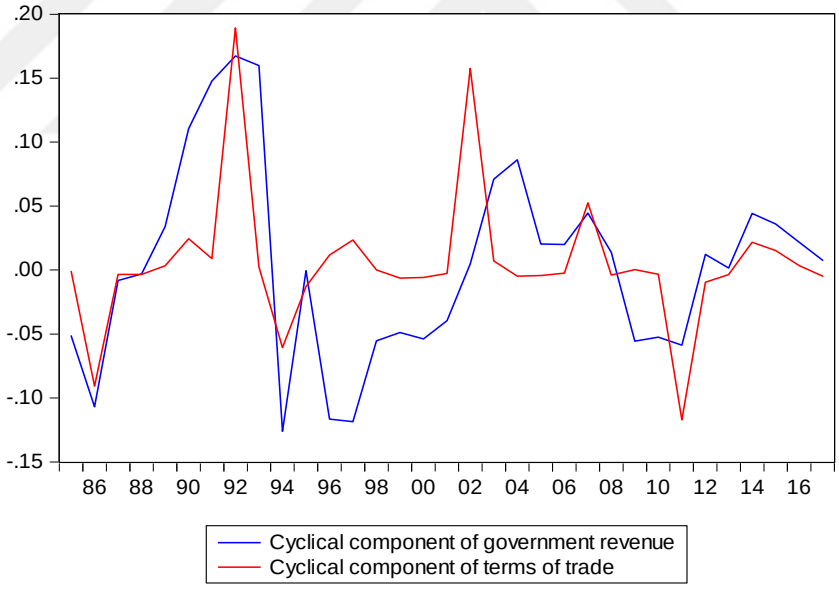

Figure 7. Cyclical component of the natural logarithm of government revenue and commodity terms of trade, 1985-2017. Cyclical components are obtained by HP(100) filtering.

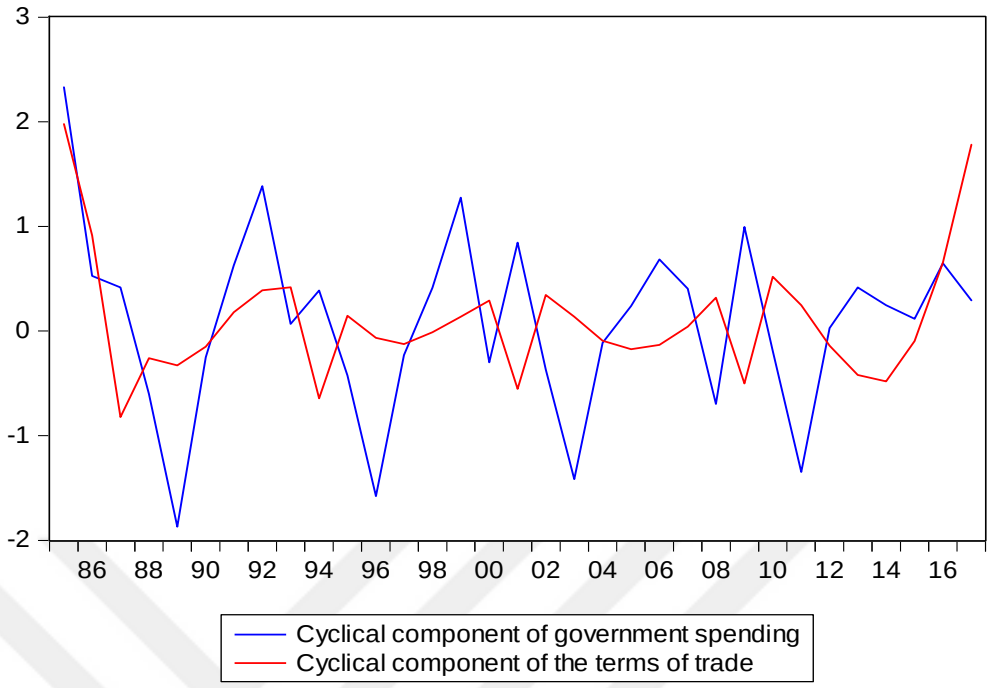

Figure 8. Cyclical component of the natural logarithm of government spending and commodity terms of trade, 1985-2017. Cyclical components are obtained by BP filter with the minimum and maximum periodicities of 2 and 8 years, respectively.

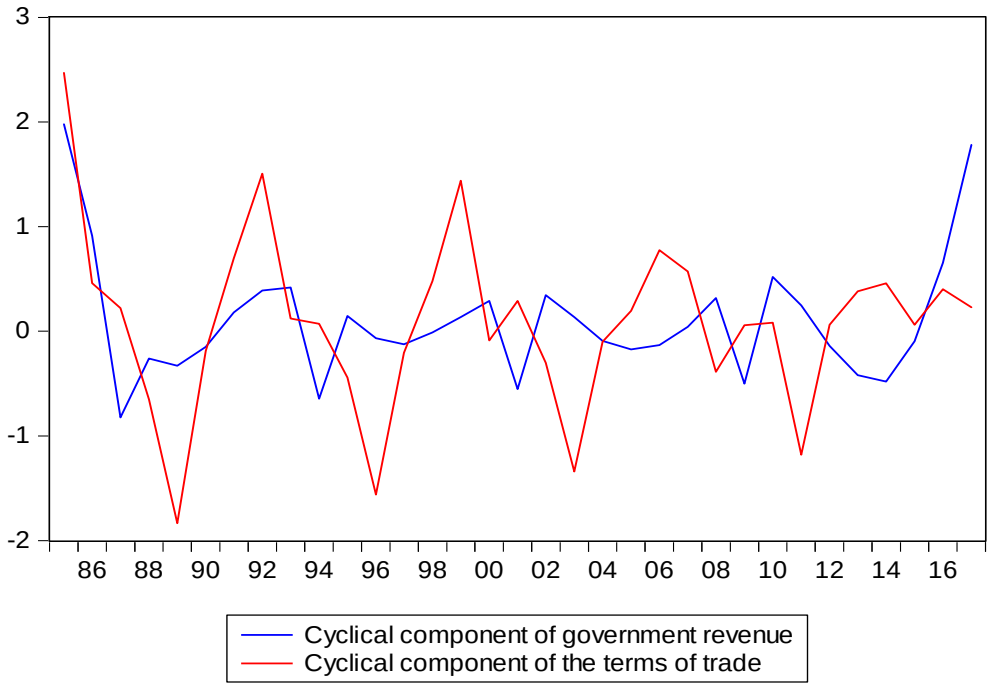

Figure 9 Cyclical component of the natural logarithm of government revenue and commodity terms of trade, 1985-2017. Cyclical components are obtained by BP filter with the minimum and maximum periodicities of 2 and 8 years, respectively.

CHAPTER 3

THEORETICAL UNDERPINNINGS

3.1. Resource Curse

The resource curse is a reference to a situation in which a country has an export-oriented natural resources sector that is a major generator of revenues for the governments and yet leads paradoxically to poor economic performance and political instability. It is commonly used to describe the negative macroeconomic outcomes associated with the dependence on natural resources. In this sub-section, we discuss the theoretical underpinning in support of the natural resource curse in resource-based economies. Figure 10 illustrates the theoretical underpinnings of the resource curse paradox.

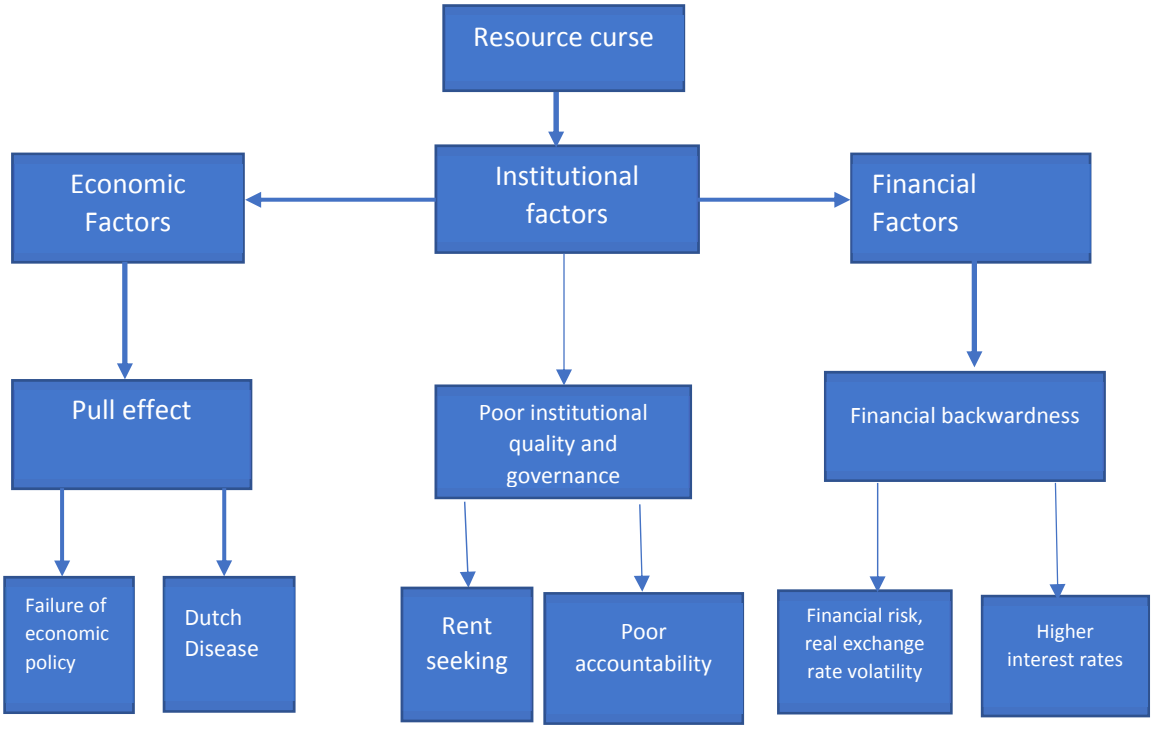

Figure 10. Diagrammatical representation of the theoretical framework.

3.1.1. Institutional Aspect of Resource Curse

The institutional aspect of the resource curse points out that natural resource-rich countries perpetuate strong institutional deficiency due to several factors including rent-seeking, autocracy, lack of democracy, corruption, and poor political institutions. From this angle, natural resources do not directly affect economic development, instead, institutions are considered as an intermediate medium (Kaufmann & Wei, 1999). Based on a political-economic model, (Ross, 2001) analyzed whether oil has anti-democratic properties and demonstrated that the availability of mineral and oil resources in a country negatively influences its democratic process. In the same vein, several authors highlight a positive association between extractive natural resources such as oil and mineral resources and corruption. These authors have shown that rent-seeking is exacerbated by so-called institutions, whereas good institutions, on the other hand, foster accountability, transparency, and therefore low levels of corruption.

Theoretically, it is reported that domestic institutions governing oil and mineral wealth play a significant role in the institutional outcomes across resource-based countries (Mahdavi, 2020). Indeed, when the natural resources sector is regulated by NOCs rather than by government ministries, there are greater incentives for malfeasance by public officials. This highlights a broader pattern of negative governance patterns due to the agency problem when SOCs, not government agencies, hold regulatory authority. In particular, the degree of regulatory autonomy plays an important role in shaping governance outcomes in RBEs. Specifically, SOCs in the extractive natural resources sectors operate in institutional environments that are opaque and lack oversight, while government agencies in the field of natural resources are subject to greater scrutiny because of their formal with government institutions and their fiscal dependence on the central government (Heller, 2017). Therefore, SOCs generally appear to be comparatively less constrained than government departments because of the greater information asymmetries between the government and its SOEs (Paul, 2008).

3.1.2. Financial Aspect of Resource Curse

In this thesis, we examine an important aspect of the resource curse hypothesis, known as the FRC. In this thesis, we claim that the FRC hypothesis operates through different

channels. Firstly, the boom phase of oil prices tends to shift the allocation of production factors across sectors. Indeed, an increase in oil prices causes a reallocation of factors out of the manufacturing sector (Alberola & Benigno, 2017; Auty, 2001; Corden & Neary, 1982; Gylfason & Zoega, 2006; Sachs & Warner, 1995). The reallocation of resources towards the tradable sector (oil sector) implies an abundant supply of productive factors, which in turn reduces the demand for financial resources of firms in the tradable sector. Given the key role of the manufacturing sector in shaping the demand for financial services (Alberola & Benigno, 2017; García-Cicco & Kawamura, 2015), the inefficient reallocation of factors out of the manufacturing sector and into the tradable sector accelerate the process of de-industrialization and impede the performance of the financial system.

Effectively, the misallocation of productive resources following episodes of oil price upswings is an important factor driving the FRC scenario in oil-based economies. As reported by (Mlachila and Ouedraogo, 2019), the institutional framework determines whether resources-based economies can mitigate the FRC or not. This argument has been initially explored by (Mehlum et al., 2006), who claimed that institutions do play a key role in explaining the resource curse hypothesis in resource-abundant countries.

Secondly, the political economy aspect of the resource curse argues that natural resources generate rents, which may give rise to rent-seeking behavior, especially when institutions are weak. In such economies where small fractions of population control resource rents, there is less incentive for the interest groups to adopt reforms needed to shape the efficiency of the financial sector (Apergis & Payne, 2014; Mahdavi, 2020; Menaldo & Yoo, 2015). However, in order to protect their natural rents, the small elites establish barriers by directed credits towards their companies, resulting in the misallocation of credits (Petersen & Rajan, 1994).

It is established that emerging and developing economies depending on resource windfalls are rentier states subject to rent-seeking activities. Indeed, large capital inflows triggered by oil booms encourage rent-seeking activities as the windfalls contribute to consolidating the interests of the elites (Tornell & Lane, 1999; Torvik, 2002). In this light, only politically connected entrepreneurs will have better access to credits at a reduced cost than unconnected entrepreneurs. Thus, under rent-seeking behavior and corruption,

entrepreneurs are unlikely to access financial services, which in turn can impede the development of the financial system (Baland & Francois, 2000). The prevalence of opportunistic behaviors and corruption during periods of resource booms negatively influence the performance of the financial system. In such a situation, rent-seeking activities lead to FRC.

Thirdly, differences in the levels of capital (physical, natural, social & human capital) play a key role in driving financial market performance in developing countries. The resource curse phenomenon is explained by the fact that natural capital (oil) crowds out other forms of capital such as social, physical and human capital and this crowding-out effect tends to delay the accumulation of other types of capital that matter for economic development as well as financial development (Behbudi et al., 2010; Gylfason, 2001; Gylfason & Zoega, 2006). As reported by Gylfason and Zoega (2006), a large upswing in resource windfalls often hampers saving and investment in resource-rich countries, and hence decreasing the investment in other forms of capital. This situation, combined with the crowding-out effect of natural capital, will cause the financial sector in some countries to dwindle, as human capital and social capital accumulation have been documented as major drivers of financial development (Dunning, 2015; Eryiğit, Eryiğit, & Dülgeroğlu, 2015; Guiso, Sapienza, & Zingales, 2000; Ibrahim, 2018; Ibrahim & Sare, 2018; Z. Khan, Hussain, Shahbaz, Yang, & Jiao, 2020; Zaidi et al., 2019). From this perspective, the FRC may occur due to the crowding-out effect of natural capital.

Fourthly, under a weak macro-prudential environment, the financial sector tends to be more vulnerable to exogenous shocks stemming from commodity (oil) markets (Masson, 2014). Given the poor macroeconomic performance in RBE, episodes of commodity booms increase the risk of a financial crisis. This is mainly due to the higher uncertainty in oil markets and the associated oil price volatilities, which cause several macroeconomic challenges for commodity-based economies (Kayalar, Küçüközmen, & Selcuk-Kestel, 2017; Khandelwal et al., 2016; C. C. Lee & Lee, 2019; H. M. Zhu, Li, & Li, 2014). Theoretically, there are two routes through which oil prices can negatively influence the financial sector. One is the inflation channel, it is documented that oil price upswings result in higher inflation and production costs. In a high-inflation environment, the returns on savings are reduced, which leads to a reduction in the pool of savers and raises credit market frictions (Boyd, Levine, & Smith, 2001). Another channel is economic growth, as

suggested by several studies oil price fluctuations present detrimental effects on economic growth (Hamilton, 1983; Sadorsky, 1999). Given the importance of economic development to promote financial development, the negative influence of oil price changes on economic growth will also hurt financial development. All in all, by considering the different mechanisms mentioned above, the dynamics of oil prices may inhibit the performance of the financial system and contribute to the FRC scenario in some oil-exporting countries.

3.2. Commodity Currency Hypothesis

It is important to discuss the different theoretical channels through which terms of trades and primary commodity prices influence the dynamics of RER. From a theoretical standpoint, there are three main channels through which commodity prices and currencies can interact. First, under the sticky price model, wages and prices are upwards sticky, positive commodity price shocks lead to inflationary pressures on real wages, nontraded goods, and exchange rate in the commodity-exporting country. Since price and wages are sticky, positive commodity price shocks only lead to exchange rate appreciation to maintain the efficient relative price equilibrium between traded and nontraded goods prices (Meese & Rogoff, 1983). Second, the portfolio balance model argues that in the short term as an asset price the exchange rate is influenced by changes in the demand and supply of domestic and foreign currency. However, an upward trajectory of commodity price increases foreign exchange holdings leading to a balance of payments surplus in commodity-exporting countries. The interaction of these factors positively influences the relative demand for the domestic currency and thereby the currency returns (Y. Chen & Rogoff, 2003). Thirdly, as stated by Chen and Rogoff (2003) commodity price changes lead to movement in the demand for an exporter's currency and may potentially explain (help to forecast) exchange rate fluctuations because the exports of primary commodities have a significant weight in the trade account of major commodity-exporting countries. This is also valid for African countries in which their economies rest mainly on the exports of primary products. Therefore, positive commodity price shocks (improvement in the TOT) lead to a sharp inflow of foreign exchange resulting in the appreciation of the RER in line with the hypothesis of the DD.

Early researches on exchange rate determination and forecasting documented that real exchange rate dynamics are perfectly captured by a random walk process, and the behavior of commodity prices tends to play a critical role in the adjustment of RER towards equilibrium. In this light, several authors examined the implication of the properties of commodity prices for the dynamics of RER in developed countries (Amano and van Norden, 1995; Chinn and Johnston, 1996; De Gregorio and Wolf, 1994; Froot and Rogoff, 1995; Gruen and Wilkinson, 1994; Mark, 1990). These authors found a close link between RER and commodity price movements and established that the behavior of commodity prices is an important trigger of long-run deviations from PPP hypothesis. These pioneers' studies stimulated the birth of the commodity currencies hypothesis according to which commodity prices appear to be a key predictor for the currencies of commodity exporters. The commodity currencies hypothesis initially developed by Chen and Rogoff (2003) and Cashin et al. (2004) argue that CTOT plays an important role in driving exchange rates of small commodity exporters.

3.3. Fiscal Pro-cyclicality

While there is agreement among economists with the normative prescription that fiscal policy decisions are the results of the tendency of government to reduce the excessive tax burden for given public expenditure levels and dynamics, some disagreement exists that, as a general rule, fiscal policy should not be procyclical. The standard Keynesian argument suggests that the government should increase spending and reduce the tax rate during an economic downturn. According to this argument, fiscal policy should be counter-cyclical to ensure short-term macroeconomic stability. On the other hand, in the neoclassical paradigm, government spending and tax rates should remain constant over the economic cycle, which will not affect macroeconomic stability. In other words, fiscal policy should remain neutral (a-cyclical) over the business cycle. Even in the intertemporal optimization framework, where the government would need to borrow in downturn episodes to support consumption and investment and would need to repay or accumulate net foreign assets in upturn episodes, the policy would not be expected to be pro-cyclical. In practice, fiscal policy in most developing countries has the opposite property and tends to be pro-cyclical (Demirel, 2010; Kaminsky, 2010; Wright & Czelusta, 2004). Especially, public expenditure increases during booms and decreases

during downturns and deficits increase during periods of upturns and decline in downturns. This suboptimal fiscal policy can exacerbate macroeconomic instability and worsen economic prospects in the long run.

Nonetheless, governments follow a pro-cyclical fiscal policy pattern for various reasons including the need to preserve the sustainability of public finances, the key role of public spending in developing countries where there is a real need for additional public spending to address critical social issues. Consideration of sustainability may be crucial in times of economic downturns in developing countries with initially higher levels of public
This also applies to developing countries that have imperfect access to the interı
credit market.

The concern about the pro-cyclical pattern of fiscal policy is mainly due to its impact on other parts of the economy. As reported by (Alberola & Montero, 2006), the pro-cyclical pattern of fiscal policy hurts social policy, and it introduces an additional source of volatility to the economy: when the economy expands, it reinforces the expansion, when it contracts, it deepens the slowdown. The capital flow cycle and the fiscal policy cycle thus tend to reinforce each other, this may lead to the so-called when it rains, it pours.

[3] An economy is said to have achieved fiscal sustainability when the ratio of public debt to GDP is stationary, and consistent with the overall demand-both domestic and foreign-for government securities.

CHAPTER 4

LITERATURE REVIEW

4.1. Relevant Papers on the FRC Hypothesis

The FRC hypothesis has been initially investigated by (Beck, 2012), who demonstrated that resource-rich countries display lower levels of financial development. The author reported that the lack of a strong financial system impedes growth prospects in these countries. Based on the panel fixed effects technique, (Bhattacharyya & Hodler, 2014) examined the validity of the FRC for a sample of 133 countries. They provided the empirical basis for the widely supported negative relationship between natural resource rents and financial development in resource-rich countries with weak institutions. By considering the role of political institutions, recently (Mlachila & Ouedraogo, 2019) focused on 68 CECs to study the impact of commodity price shocks on financial development indicators. Their data confirmed the financial resource curse scenario under weak democratic institutions. Their estimation strategies lie on the use of the panel GMM approach and the AMG techniques. For the case of the United States, (M. A. Khan, Khan, Abdulahi, Liaqat, & Shah, 2019) tested the financial resource curse hypothesis using the autoregressive distributed lag approach. The ARDL analysis results suggested that natural resource rents (oil, natural gas, coal, mineral, and forest rents) have detrimental effects on financial development. Considering the possible asymmetric effects in the examination of the financial resource curse, (Dogan, Altinoz, & Tzeremes, 2020) employed the quantile estimation approach to study the effects of natural resource rents on financial development. Their data significantly reject the financial resource curse scenario for developed countries. (Atil, Nawaz, Lahiani, & Roubaud, 2020) reached a similar conclusion and suggested a significant positive impact of oil price on financial development in Pakistan.

Using micro-based evidence for a sample of 2310 commercial banks in 30 oil exporting-countries, (Al-Khazali & Mirzaei, 2017) studied the linkages between oil price movements and financial performance. Their estimation strategies based on a panel GMM approach emphasize an asymmetric effect of oil price shocks on bank nonperforming loans. Particularly, they found that a decrease (increase) in oil prices causes a rise (fall) in bank nonperforming loans, respectively. Under similar econometric methodology, (Khandelwal et al., 2016) demonstrated a feedback nexus between oil prices and bank performance indicators in the GCC countries.

(Nwani, Iheanacho, & Okogbue, 2016) investigated the nexus between oil revenue and financial development in Nigeria. Their main findings illustrated that crude oil prices positively influence financial intermediary in Nigeria. Conversely, (Miyajima, 2016) researched the linkages between oil prices, credit and deposit, and nonperforming loans in Saudi Arabia. Simulation results showed that oil price fluctuations decrease credit and deposit growth, while an increasing effect of oil price changes on nonperforming loans ratio is observed. These findings stressed the sensitivity of the financial system to oil price shocks.

By accounting for endogeneity, (Beck & Poelhekke, 2017) found that world oil price shocks harm financial sector deposits. For a sample of 38 African countries, (Dwumfour & Ntow-Gyamfi, 2018) revealed a positive influence of natural resources rents on financial development indicators. (Guan, Kirikkaleli, Bibi, & Zhang, 2020) explored the financial resource curse hypothesis within a multivariate framework by controlling for the role of globalization, human capital, and economic growth. The authors found that natural resource rent has a negative impact on financial development in China.

From the aforementioned studies, one may emphasize that empirical studies mainly focused on natural resource rents to investigate the financial resource curse. As previously discussed, the use of natural resource rents can be endogenous and leads to reverse causality issue. Only a few studies used an advanced panel data approach to deal with endogeneity issues (Beck & Poelhekke, 2017; Khandelwal et al., 2016; Mlachila & Ouedraogo, 2019)**.** Another important shortcoming in the literature is that studies employed linear time series/panel data techniques and ignores the potential nonlinearity which may arise due to changes in primary commodity prices and/or financial reforms.

It is important to consider these two dimensions (endogeneity and nonlinearity) in the analysis of the financial resource curse hypothesis. This study reconciles these two dimensions by employing robust econometric techniques able to monitor both nonlinearity and endogeneity, simultaneously. To help readers in following the structure of the literature over time, we provide the evidence-based literature on the financial resource curse in Table A2 (in the appendix).

4.2. Previous Empirical Studies on the Commodity Currencies Hypothesis

The recent empirical literature has also documented the commodity currencies hypothesis for developed and emerging countries through various econometric approaches. Since these seminal works, the literature on the commodity price-exchange rate nexus can be categorized under two broad research streams.

The first focuses on the effects of a single commodity price index (or, more generally, terms of trade) on the real effective exchange rate. For example, Cashin et al. (2004) constructed monthly indices of commodity price based on forty-four commodities for 58 commodity-exporting countries and analyzed their effects on the real exchange rates. In their study, the authors introduced the hypothesis of commodity currencies to explain the implication of commodity price fluctuations for the real exchange in small open commodity-exporting countries. In other words, they demonstrated that higher commodity price improves trade balance in commodity exporters and may result in the appreciation of the domestic currency of countries that are highly dependent on the exports of commodities. They found that about one-third of the commodity-exporting countries in their sample have commodity-currencies. Following this influential paper by Cashin et al. (2004), several empirical works have confirmed the existence of commodity-currencies in countries with a large commodity-based export sector. Clements and Fry (2008) examined the intersection between commodity prices and currencies of countries in commodity-exporting countries and estimated the extent that commodities are driven by currencies, or that currencies are indeed driven by commodities in Canada. Australia and New Zealand. The authors employed the Kalman filter approach and emphasized that commodity returns are more influenced by the currency factor than vice versa. Their empirical results provided evidence against the prediction of the commodity-currencies hypothesis. Specifically, they found evidence for spillovers from currency returns to

explain between 2 and 5.2 percent of commodity price volatility, while spillovers from commodities contributed less than 1% to the volatility of the Australian dollar, the New Zealand dollar and the Canada dollar. Chen and Rogoff (2003) rather showed that commodity price volatilities have significant effects on floating real exchange rates in Australia, New Zealand, and Canada. In a recent paper, Belasen and Demirer (2019) examined the presence and direction of return and volatility transmissions between several advanced and emerging market currencies and commodity prices through the causality in variance approach advanced by Hafner et al. (2006). They found strong causal effects from currency to commodity markets with mostly insignificant unidirectional causality from commodity to currency markets. Focusing on the price of gold, (Sjaastad & Scacciavillani, 1996) stressed that appreciations or depreciation of European currencies have strongly affected the world price of gold. Al-Abri (2013) used the GMM model for a panel of 53 primary commodity-exporting countries to provide evidence on the nonlinear effect of terms of trade shocks on the real exchange rate. Specifically, the author emphasized that greater financial integration mitigates the negative influence of CTOT shocks on exchange rate volatilities. Chia and Alba (2006) constructed a dynamic stochastic general equilibrium model of a small open economy to investigate the effects of terms of trade shocks on exchange rate regimes and other macroeconomic indicators. The authors showed that the effects of CTOT shock on exchange rates depend on the type of exchange rate system (floating/fixed exchange rate). They revealed that countries moving from fixed to floating exchange rate regime experienced higher exchange rate volatility resulting from terms of trade shocks. Broda (2004) investigated the contribution of CTOT shocks to movements in the real exchange rate, real GDP, and prices in developing countries across different exchange rate regimes. Using the standard VAR approach, the author reported that countries with flexible regimes are able to buffer real shocks better than those with fixed regimes.

As indicated early, many of the existing studies usually used either a single commodity price or indices of country-specific commodity prices to capture exogenous shocks in terms of trade. As discussed in Gruss and Kebhaj (2019) such a measure may provide a poor approximation for terms of trade shocks. In reaction to these shortcomings, we use the recent commodity terms of trade data of Gruss and Kebhaj (2019) which helps circumvent the aggregation and measurement problems in the construction of country-

specific commodity price index. This newly advanced time-series data is large enough to cover several periods of economic and financial dynamism, hence enabling us to provide more realistic and updated insights.

The second strand of literature focuses on the relationship between individual primary commodity prices and RERs. Our focus is on agricultural, energy, metal, and food and beverages commodity prices, which constitute the most traded commodity highly important for the African economies. A substantial body of the literature has examined the relationship between energy prices and real exchange rate (Jawadi, Louhichi, Ameur, & Cheffou, 2016; Kilian, 2009; Kumar, 2019; Malik & Umar, 2019; Nusair & Olson, 2019; Juan C. Reboredo, 2012; Juan C. Reboredo & Rivera-Castro, 2013; Sadorsky, 2000; Xu, Han, Wan, & Yin, 2019; Zhang, Fan, Tsai, & Wei, 2008; H. Zhu & Chen, 2019). The findings of these studies are mixed and vary substantially depending on the econometric technique (linear/nonlinear specification), the time frame of the sample, and whether the country is a net exporter or net importer of oil (Baghestani, Chazi, & Khallaf, 2019). Concerning the methodological approach, time series analyses have been widely used in the current literature. As discussed in the introduction section, the statistical features of the estimation techniques used in these studies do not exploit the cross-section structure of the data and mostly rely on the country-by-country application of time series approaches (Westerlund & Sharma, 2019). In light of this, the present study follows the panel time series approach as a reaction to previous literature.

Most of the early studies are restricted to the oil market and ignored other primary commodity markets such as agricultural, metal, and food commodity markets. To the best of authors' knowledge, the consideration of the individual primary commodity price and real exchange rate nexus has not been rigorously analyzed in previous studies even though it has been recently demonstrated that primary commodity markets provide a substantial explanation of real exchange rate movements (Ayres, Hevia, & Nicolini, 2019). The only few exceptions in this regard are studies exploring the dynamics of precious metal prices and exchange rate fluctuations (Balcilar et al. 2019; Churchill et al. 2019; Jain and Ghosh 2013; Sari et al. 2010). An important gap in the current literature is that past studies are restricted to developed/emerging countries and their findings cannot be valid for possible generalization for primary commodity-exporting countries in Africa. To bridge this gap, this study focuses on the effects of primary commodity price shocks on the real exchange

rates in Africa. This is important as most of the commodity-exporting countries in Africa react differently to shocks in commodity markets depending on the type of commodity their exports. After observing the findings of the relevant literature given above, this study addresses the following RQ:

RQ 1: Are the magnitude of real appreciation and real depreciation arising from positive and negative shocks in real terms of trade and primary commodity prices the same?

RQ 2: How does the reaction of the real exchange rate to primary commodity price shocks differ across individual commodity subgroups?

4.3. Literature Related To The Effects of the Terms Of Trade On Fiscal Variables

This study is also related to several literature strands. First is the literature on the effects of terms of trade shocks on real factors. This strand of the literature dates, at least, to the influential writings of (Prebisch, 1950) and (Singer, 1975) asserting that the terms of trade tend of developing countries have a tendency to deteriorate through time and that this decline in relative export prices has led to stagnation and further impoverishment. These influential writings have inspired several authors to study the relationship between terms of trade and macroeconomic indicators through theoretical and empirical approaches. For instance, (Mendoza, 1997) found that the increased variability on the terms of trade variability can have a positive or negative effect growth depending on the degree of risk aversion, but that the overall effect reduces social welfare. There is a large and expanding literature suggesting that terms of trade shocks are one the primary reasons for the poor growth in developing countries (Deaton & Miller, 1995; Hoffmaister, Roldos, & Wickham, 1998; Kose & Riezman, 2001). These studies focused on African economies and concluded that terms of trade shocks play an important role in driving macroeconomic fluctuations. In the same vein, (Bleaney & Greenaway, 2001) employed a fixed effect panel regression approach to study the effects of terms of trade volatility and real effective exchange rate on investment and growth for a panel of 14 SSA countries over 1980-1995. The authors demonstrated that growth is negatively affected by terms of trade volatility and investment by real exchange rate variability. Ali and Anwar (2018) used a DGSE model to study the effects of anticipated and unanticipated terms of trade shocks. The authors found significant evidence in favor of the *J-curve* phenomenon in response to

anticipated terms of trade, while an unanticipated term of trade shock increases real output as well as inflation, but the J-curve effect may not hold under certain condition. Using a dynamic GMM model and data for 45 developing countries, Chowdhury (2015) examined the effect of terms of trade shocks on the savings rate. The author demonstrated that the transitory component in terms of trade has a larger positive impact than the permanent component. Recent detailed studies of terms of trade in SSA countries, have come to much more positive conclusions and found that the adverse effect of the terms of trade shock on growth is particularly relevant under fixed exchange rates regimes (Broda, 2004; Edwards & Levy Yeyati, 2005). Recently, the literature has also given much prominence to the role of the financial sector in dampening the effects of terms of trade shocks on macroeconomic outcomes (Chowdhury, 2015; Grigoli, Herman, & Schmidt-Hebbel, 2016; M. Kim, 2020). Besides, another wave of studies has analyzed the macroeconomic implications of alternative monetary policy regimes under external shocks (terms of trade and commodity price shocks) in small open economies (Hove et al., 2015; Laxton & Pesenti, 2003; Medina, 2010).

Unlike the previous literature, which examined the effects of terms of trade on economic growth and other macroeconomic aggregates, there has been less research on the impact of terms of trade shocks on the cyclicality of fiscal policy in SSA countries.

The second strand is the literature on the fiscal effects of terms of trade shocks. Several studies highlight the fundamental difference between the properties of fiscal policies in developing compared to advanced economies. Evidence suggests that public spending and taxes are procyclical in developing countries but much less so in advanced countries (Céspedes & Velasco, 2014; Coutinho, Georgiou, Heracleous, Michaelides, & Tsani, 2013; Frankel, Vegh, & Vuletin, 2013; Gavin & Perotti, 1997; Kaminsky, 2010; Kaminsky et al., 2004; Niemann & Pichler, 2020; Ouedraogo & Sourouema, 2018; Talvi & Végh, 2005; Wright & Czelusta, 2004). The explanation advanced to rationalize this pattern include political distortions, borrowing constraints (Ilzetzki, 2011; Tornell & Lane, 1999). For instance, Céspedes and Velasco (2014) revealed that fiscal policy follows a pro-cyclical pattern in commodity-exporting countries with a poor institutional environment. They argued that the presence of fiscal rule also led to a more counter-cyclical fiscal policy. Arezki and Ismail (2013) have further suggested that the implementation of fiscal rules has had limited effects in terms of reducing current

spending during good times, while it may have resulted in a systematic reduction in capital spending during downturns in oil-producing countries. The authors emphasized a potential asymmetry in the degree of responsiveness of expenditure policy during boom-bust in commodity price cycles. In line with the fiscal rule, (J. L. Combes, Minea, & Sow, 2017) claimed that the adoption of fiscal rules such as golden rule and the national rule is more effective to switch fiscal policy from pro-cyclical into a-cyclical and counter-cyclical, respectively. They also reported a non-linear response of fiscal policy to the business cycle, which is conditioned by the level of debt stock. Considering the degree of financial depth, (Konuki & Villafuerte, 2016) concluded that greater financial depth reverses the pro-cyclicality pattern of fiscal policy among SSA countries. Based on a sample of 40 sub-Saharan African countries, (Ouedraogo & Sourouema, 2018) argued that export concentration leads to a more-procyclical fiscal policy. This procyclical behavior of a fiscal policy is dampened if a country has a sovereign wealth fund. This provides empirical support to the empirical findings of (Mohaddes & Raissi, 2017). They emphasized that stronger fiscal institutions and the establishment of SWFs can help countries to pursue less procyclical or more countercyclical fiscal policy.

By large, the literature on the pro-cyclical behavior of fiscal policy in commodity-exporting countries does not consider enough the type of fiscal policy (government spending versus taxations), the effect of terms of trade shocks, the degree of trade and financial openness and the role of exchange rate regimes, although some studies emphasized the role of terms of trade shocks in shaping fiscal variables (Kaminsky, 2010; Kaminsky et al., 2004). This is important, specifically in SSA countries with a higher reliance on export revenue. For instance (Kaminsky, 2010) documented that fiscal policy follows a pro-cyclical pattern with respect to terms of trade shocks in developing countries. The author also argued that flexible exchange rate regimes enhance counter cyclicality behavior of fiscal policy for upper-middle-income countries. We complement this study by exploring the role of trade and financial openness in mitigating/amplifying the degree of fiscal procyclicality in SSA countries.

CHAPTER 5

EMPIRICAL METHODOLOGY AND DATA

5.1. Empirical Methodology

In this section, we expose the empirical methodologies used in this thesis. Firstly, we present cross-sectional dependence tests. Given the higher chance of cross-sectional dependence in macro panel data analysis, we explore the presence of cross-sectional dependence in our model following (M.Hashem Pesaran, 2004). Secondly, we describe the panel unit root tests used in this thesis. It is important to note that we employ panel unit root tests robust to cross-sectional dependence issues. These new generations of panel unit root tests have been widely discussed in the literature. Lastly, as discussed in the Introduction section, our estimation strategies rely on sophisticated panel data approaches. Specifically, we employ the panel smooth transition regression model, the dynamic panel threshold model, the nonlinear panel autoregressive distributed lag model, and lastly, the interactive fixed effects methods. These techniques enable us to deal with various econometric issues ignored in the existing literature regarding the macroeconomic implications of external shocks. In doing so, this thesis provides an up to date and complements the theoretical and empirical literature.

5.1.1. Cross-Sectional Dependence

As discussed previously, the presence of spatial correlations, omitted global variables or the presence of common shock tend to induce interdependence among panel members even though their impacts may not be uniform across the cross-section units. As our panel members are prone to cross-sectional correlated errors resulting from spillover effects due to trade openness, capital, and labor mobility and other networks, we apply the CSD test

developed by (M.Hashem Pesaran, 2004) to test the cross-sectional independence of the residuals in the regression. The CSD test followed in the study is defined as:

$$CSD = \sqrt{\frac{2T}{N(N-1)}}\{\Sigma_{i=1}^{N-1}\ \Sigma_{j=i+1}^{N-1}\hat{\varphi}_{ij}\} \quad (1)$$

where $\hat{\varphi}_{ij}$ is the pair-wise correlation coefficient of the cross-sectional residuals obtained from ADF regression. T and N denote time and cross-section dimensions, respectively. The *CSD* statistic is testing the null hypothesis of cross-sectional independence and has a two-tailed standard normal distribution.

5.1.2. Panel Unit Root Tests

Moon and Perron (2004) develop a factor model to test the presence of a unit root in panel data subject to cross-sectional dependence. They assume the presence of a common factor in the error term:

$$x_{it} = (1-\Lambda_i)\mu_i + \Lambda_i x_{it} + u_{it} \quad \text{and} \quad u_{it} = \xi_i' F_t + v_{it} \quad (2)$$

With $i = 1,\dots,N$ and $t = 1,\dots,T$. F_t represents $m \times 1$ vector of common factors, ξ_i is also $m \times 1$ coefficients vector corresponding to the unobserved factor loadings and v_{it} denotes an idiosyncratic cross-sectionally uncorrelated error term, which follows a K-unobserved-common factors model to which an idiosyncratic shock is added.

Moon and Perron (2004) test the following null hypothesis of a unit root H_0: $\Lambda_i = 1$ for $i = 1,\dots,N$ which is tested against the heterogenous H_1: $\Lambda_i < 1$ for some i. (Moon & Perron, 2004) examine the local power of their test based on the following local alternative hypothesis:

$$\Lambda_i = 1 - \frac{\gamma_i}{\sqrt{NT}} \quad (3)$$

Where γ_i is a random variable with mean μ_0. The null hypothesis of the local unit root becomes H_0': $\mu_0 = 0$, which is tested against the alternative hypothesis H_1': $\mu_0 > 0$. The authors proposed the use of two consistent t-statistics (t_α^* and t_β^*) with standard normal

distribution for the null hypothesis of homogenous unit root hypothesis against the heterogenous alternative:

$$t_{\alpha}^{*} = \frac{\sqrt{NT}(\hat{\lambda}^{*}-1)}{\sqrt{\frac{2\hat{\varphi}_{v}^{4}}{\hat{w}_{v}^{4}}}} \quad \text{and} \quad t_{\beta}^{*} = \sqrt{NT}\left(\hat{\lambda}^{*} - 1\right)\sqrt{\frac{1}{NT^{2}} tr\left(X_{t-1}Q_{\hat{\Delta}}X_{t-1}'\right)}\left(\frac{\hat{w}_{v}}{\hat{\varphi}_{v}^{2}}\right) \qquad (4)$$

Where $\hat{\varphi}_{v}^{4}$ represents the cross-sectional average of $\hat{w}_{v}^{4}$. The statistics t_{α}^{*} and t_{β}^{*} are drawn from an estimator of projection matrix and estimator of long-run variances $\hat{\varphi}_{v}^{2}$.

To account for the possibility that the DGP exhibits nonlinearity and cross-section dependence at the same time, the unit root tests developed by Lee and Tieslau (2019) are employed in this study. Lee and Tieslau (2019) develop an LM-type (Lagrange multiplier) unit root test that allows for heterogeneous trend shifts such that the trend break can be located at different periods for different cross-sectional units. Also, their estimation approach can be modified to correct for the presence of cross-section dependence in the innovations of the panel. The testing model proposed by (J. Lee & Tieslau, 2019) is given in Equation (5) as:

$$\Delta y_{it} = \delta_{i}'\Delta Z_{it} + \beta_{i}\tilde{y}_{it-1} + \Sigma_{p=1}^{P} d_{ip}\,\Delta\tilde{y}_{it-p} + e_{it} \qquad (5)$$

Note that ΔZ_{it} captures the deterministic components that include dummy variables to capture level and trend shifts, the lagged term, $\Delta\tilde{y}_{it-p}$ is introduced to adjust for serially correlated and heterogeneously distributed innovations. Equation (5) above assumes zero correlations in the innovations across the panel, which is technically unrealistic. To deal with cross-correlations in the innovations, Lee and Tieslau (2019) assume that the error term in equation (5) has the following factor structure:

$$e_{it} = \lambda_{i}f_{t} + v_{it} \qquad (6)$$

With f_{t} the unobserved common factor. Lee and Tieslau (2019) consider the testing procedure advanced by Pesaran (2007), which consists of taking the cross-section averages of the individual series is used as a means to correct for cross-sectional dependence.

$$\Delta y_{it} = \delta_i' \Delta Z_{it} + \partial_i \tilde{S}_{it-1}^{*} + g\tilde{S}_{t-1}^{*} + h\Delta\tilde{S}_{t}^{*} + \Sigma_{p=1}^{P} g_{ip}\, \Delta\tilde{S}_{it-p} + \Sigma_{p=1}^{P} d_{ip}\, \Delta\tilde{S}_{it-p} + e_{it} \quad (7)$$

Where $\tilde{S}_{it-1}^{*}$ denotes the cross-section averages of lagged levels of the series and $\Delta\tilde{S}_{t}^{*}$ represents the cross-section averages of the first differences of the series.

Lee and Tieslau (2019) define the null hypothesis of unit root for cross-section unit i as H_0: $\partial_i = 0$ for all i, which is tested against the alternative hypothesis H_1: $\partial_i < 0$, for some i. The panel LM statistic for these hypotheses can be drawn as the standardized version of the following average test statistic:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} \bar{\zeta}_i \quad (8)$$

Where $\bar{\zeta}_i$ is the t-statistic for $\partial_i = 0$ in the testing regression (7).

5.1.3. Panel Threshold Models

In this thesis, we robustify the empirical evidence by modeling both endogeneity and threshold effect in the investigation of the FRC hypothesis. It is important to highlight that these issues have been ignored in previous studies although they matter in the investigation of the FRC hypothesis.

We employ the recent advanced panel threshold techniques namely PSTRM and DPTRM models to assess the interaction among oil prices, finance, and institutions. The smooth transition regression model performs well in the case of cross-country heterogeneity and captures both smooth and abrupt changes in the data generating process. Modeling the regime changes in the panel setting remains an important challenge in the empirical application. In order to capture the original DGP, we allow the model to capture the types of regime changes by using the panel smooth transition regression proposed by (Gonzales A, Teravistra T, van Djik D, 2005). Indeed, this approach has been widely to study the nonlinear relationship between several macroeconomic variables (Allegret, Couharde, Coulibaly, & Mignon, 2014; Fouquau, Hurlin, & Rabaud, 2008; Senhadji Semlali & Khan, 2000; Yolcu Karadam, 2018). In this thesis, we employ the panel smooth transition

technique to explore the possible threshold effect of democratic accountability in the FRC scenario.

To account for both endogeneity and threshold effect, simultaneously, we use a new estimation frame developed by (Kremer, Bick, & Nautz, 2013). As highlighted above, this setting allows us to tackle endogeneity from the nonlinear perspective in contrast to conventional panel data techniques widely used in the literature (GMM, IV, 2SLS). Given that it is now widely agreed that both endogeneity and nonlinearity matter in the relationship between oil prices-financial development-institutions, estimation techniques ignoring these issues may lead to wrong inferences. This study provides a complete picture of the financial resource curse by using advanced panel data techniques in order to cope with previous econometric pitfalls.

5.1.3.1. Panel Smooth Transition Regression

To estimate the threshold level of democratic accountability in the oil price fluctuations and financial development nexus, we build a panel smooth transition regression model to accommodate the possible instability due to oil price uncertainties. This approach perfectly deals with the time-varying nature of the relationship between variables and model cross-country heterogeneity by splitting the sample based on the estimated threshold. Another important advantage of this setting is that it does not impose any restriction in the threshold variable and determines the threshold levels endogenously by a data-driven approach.

Given the lack of consensus regarding the validity of the financial resource curse hypothesis, we assume that the linkages between oil price dynamics and financial outcomes can be either positive or negative, which is not necessarily linear. It is of great importance to estimate the level of democratic accountability able to shift the effects of oil prices on financial development. In contrast to previous models interacting variables, the PSTRM identifies the threshold level of democracy without knowing the original data generating process of the threshold variable. We believe that the panel smooth transition regression yields a more precise estimation of the threshold levels of democratic accountability, which is necessary to mitigate the financial resource curse.

In general, the panel smooth transition regression model can be specified as follows:

$$FDEV_{it} = \mu_i + \delta_0 X_{it} + \delta_1 X_{it} * G(q_{it};\, \gamma; c) + \epsilon_{it} \qquad \text{with} \qquad \gamma > 0 \qquad (9)$$

Where $i = 1,2, \ldots \ldots N$ and $t = 1,2, \ldots \ldots T$ being the countries under review and the time dimension of the panel, respectively. $FDEV_{it}$ denotes the measure of financial development (dependent variable). μ_i represents the individual fixed effects, X_{it} is an $(m \times 1)$ exogenous variables, including the set of time-varying regressors such as oil prices and the other covariates considered as a driver of financial development. Equation (9) captures the drivers of financial development from a time-varying perspective under different regimes of democratic accountability. The error term ϵ_{it} is assumed to be *i.i.d.* $G(q_{it};\, \gamma; c)$ is the transition function which is assumed to be a continuous and smooth function of the transition variable q_{it}, corresponding to democratic accountability.

Following Gonzales et al. (2005, 2017), we specify the following exponential transition function:

$$G(S_{it};\, \gamma; c) = \left[1 + \exp(-\gamma \prod_{j=1}^{n} (q_{it} - c_j))\right]^{-1} \qquad (10)$$

with γ standing for the speed of transition across regimes. c_j, *j=1,2…..n* is a vector of n-dimensional location. $G(q_{it};\, \gamma; c)$ is restricted between 0 and 1 indicating the two regimes. Depending on the level of democracy which is the transition variable, the link between oil price and financial development and its determinants is specified by the parameter δ_0 in the first regime (when $G(q_{it};\, \gamma; c) = 0$) and the effect of X on (X-elasticity of) financial development equals $\delta_0 + \delta_1$ when $G(q_{it};\, \gamma; c) = 1$. However, when q_{it} shows a higher level, $G(q_{it};\, \gamma; c)$ leads to a smooth movement of the coefficients of regression from δ_0 to $\delta_0 + \delta_1$.[4] For instance, the effects of oil price on

[4] In the PSTR framework, we only interpret the signs of δ_0 and δ_1 rather than their values mainly because of the large set of coefficients lying between δ_0 and δ_1.

financial development vary across country and time given the value taken by the transition function as below:

$$\frac{\partial FDEV_{it}}{\partial X_{it}} = \delta_0 + \delta_1 G(q_{it};\ \gamma; c) \quad (11)$$

Based on the size of γ, the panel smooth transition model can behave like a panel transition regression proposed by (Hansen, 1999) or a linear panel data model with individual fixed effects. For instance, a higher value of γ implies that the panel smooth transition model turns into the panel threshold regression, while when γ gets close to zero the panel smooth transition model is similar to the linear panel data with individual fixed effects. Thus, the panel smooth transition model is flexible enough to accommodate both types of models. A generalization of the panel smooth transition model with more than two extreme regimes can be written as:

$$FDEV_{it} = \mu_i + \delta_0 X_{it} + \sum_{j=1}^{r} \delta_j X_{it} * G_j\left(q_{it}^{j};\ \gamma_j; c_j\right) + \varepsilon_{it} \quad (12)$$

Where $G_j\left(q_{it}^{j};\ \gamma_j; c_j\right)$ with $j = 1, \ldots r$ is a logistic function as defined in Equation (10). $r + 1$ denotes the number of extreme regimes, although r is the number of transition functions. Thus, $H_0: r = 0$ test the null hypothesis of no transition function, suggesting that the model is linear. $H_1: r = 1$ is the alternative hypothesis testing the existence of one transition function, implying a two regime nonlinear model. By generalizing, $r = 2$ corresponds to three regimes and two transition functions nonlinear model.

The procedure for estimating the PSTR model involves the use of the fixed effects estimator to eliminate the cross-country effects and then the NLLS to estimate the transformed model. Following Gonzales et al. (2005, 2017), we can define the following estimation procedure for panel smooth transition regression models as:

(i) Test the null hypothesis of linearity against the alternative smooth transition type nonlinearity (or testing homogeneity against the alternative PSTRM). If linearity is

rejected, select the appropriate transition variable S_{it} and the form of the transition function. Following Gonzales et al. (2005, 2017), the testing sequence is as follows

$H_0: \gamma = 0$ or $H_0: \delta_0 = \delta_1$. In order to overcome the unidentified nuisance parameters problem under the null hypothesis (Luukkonen, Saikkonen, & TerÄsvirta, 1988) suggested replacing the transition function $G(q_{it}; \gamma; c)$ with its first-order Taylor approximation around $\gamma = 0$ and to test the equivalent hypothesis based on the following regression.

$$FDEV_{it} = \mu_i + \delta_0 X_{it} + \delta_1 X_{it} q_{it} + \delta_2 X_{it} q_{it}^2 + \cdots + \delta_m X_{it} q_{it}^m + \varepsilon_{it} \qquad (13)$$

Then, testing the null hypothesis of linearity in Equation (13) can be specified as $H_0: \delta_0 = \delta_1 = \cdots \delta_m$. This test can be done by an *LM-type* test and has an *F*-distribution as below

$$LM_F = \frac{(\mathrm{SSR}_0 - \mathrm{SSR}_1)/mK}{\mathrm{SSR}_0/(TN-N-mK)} \sim F\big(mK, TN - N - K - m(K + 1)\big) \qquad (14)$$

Where SSR_0 is the sum of squared residuals under H_0, and SSR_1 represents the panel sum of squared residuals under H_1. K represents the set of explanatory variables. T number of years, N number of countries, m is the order of the logistic transition function in (5).

(ii) Specify the number *r* of transition functions and determine the number of extreme regimes which is equal to *r+1.*

(iii) Estimate the parameters in the selected PSTRM model using the nonlinear least squares, once the data have been demeaned (Hansen, 1999; Gonzales et al. 2005, 2017).

(iv) Check the validity of the estimated PSTR model by performing the test of no remaining heterogeneity.

5.1.3.2. Dynamic Panel Threshold Regression

As indicated previously, our purpose in this part is to explain and present the relevance of the dynamic panel threshold analysis. Due to the higher chance of endogeneity of oil prices in the large sample of oil-exporting countries, it is critical to control such a reverse causality from a nonlinear perspective in order to estimate efficiently the threshold level

of democratic accountability, which is free from endogeneity issues. Since the oil-exporting countries under review can shift the dynamics of world oil prices, the assumption of strong oil price exogeneity may not be valid in some cases. This means that oil price fluctuations are subject to endogeneity problems partly due to the feedback effects from financial uncertainty in major oil-exporting countries onto changes in world oil prices.

To address endogeneity in our panel data analysis under a nonlinear perspective, we revisit the sensitivity of the baseline findings (obtained from the panel smooth transition regression) to the dynamic panel threshold model approach introduced by Kremer et al. (2013). This approach extends the static panel threshold model proposed by (Hansen, 1999) by accounting for endogenous regressors through the use of the generalized method of moments type estimates. The estimation strategy can be summarized as below: (i) the forward orthogonal deviations transformation proposed by (Arellano & Bover, 1995) are used to remove the individual fixed-effects. Such a transformation avoids some statistical problems related to the serial correlation of transformed errors. (ii) the *2SLS* technique is considered to estimate the dynamic panel threshold model. In this setting, the threshold value is taken as having the smallest sum of squared residuals. Once the threshold value is determined, (Kremer et al., 2013) estimate both the time-varying and the time-invariant regressors in the dynamic panel threshold model by performing GMM type estimators, which allow for endogeneity.[5]

(Kremer et al., 2013) used the following setting:

$$y_{it} = \beta_i + \alpha_1 z_{it} I(S_{it} \leq \zeta) + \alpha_2 z_{it} I(S_{it} > \zeta) + dx_{it} + e_{it} \qquad (15)$$

where subscripts i and t present country and time, respectively. The country fixed effect is captured by β_i, and ζ is the threshold value, with $I(\cdot)$ being the indicator function of threshold. z_{it} represents the regime dependent variable, while x_{it} stands for the regime independent control variables including the lagged dependent variables. α_1 and α_2 correspond to the effect of a regime dependent variable on y_{it} across different regimes.

[5] For further details with refer the interested readers to (Kremer et al., 2013).

(Kremer et al., 2013) used the technique proposed by (Arellano & Bover, 1995) based on the orthogonal deviations transformation to eliminate fixed effects by removing the average of the future values of the variables in contrast to previous techniques based on within transformation and first differencing, which are subject to serial correlation and inconsistent estimates problems.

(Kremer et al., 2013) transformation technique can be specified as :

$$e_{it}^{*} = \sqrt{\frac{T-t}{T-t+1}}\,[e_{it} - \frac{1}{T-1}(e_{it+1} + \ldots + e_{iT})] \qquad (16)$$

The uncorrelatedness of the errors will be maintained as :

$$Var(e_{it}) = \sigma^2 I_T \quad \Rightarrow \quad Var(e_{it}^{*}) = \sigma^2 I_{T-1}$$

Following (Hansen, 1999) the critical values for the threshold variable can be illustrated as:

$$\Gamma = [\,\zeta : LR(\zeta) \leq F(\alpha)] \qquad (17)$$

with $F(\alpha)$ indicating the 95% percentile of the asymptotic distribution of $LR(\zeta)$. After identifying $\hat{\zeta}$, the regime dependent parameters can be estimated using the GMM approach.

This method allows us to estimate the threshold level of democratic accountability in the relationship between oil prices and financial development. Besides, the DPTRM provides robust results by instrumenting the endogenous term. More importantly, it allows testing the level of significance of the threshold variable in order to confirm whether the nonlinear specification is appropriate.

5.1.4 Nonlinear Distributed Lag models

To empirically assess the effects of CTOT shocks on real exchange rates depending on positive and negative changes in CTOT, we employ the nonlinear autoregressive distributed lag models advanced by (Shin, Yu, & Greenwood-Nimmo, 2014). This

approach enables us to identify both linear and nonlinear relations within the same econometric framework.

The nonlinear panel ARDL is built on the basis of the nonlinear ARDL approach advanced by Shin et al. (2014), which inherits several advantages such as (i) accommodating the combination of I(0) and I(1) variables; (ii) isolating the short and long-run asymmetries in a nonlinear specification with its error correction representation; (iii) providing robust results in the presence of omitted variable bias and bi-directional feedback effects between commodity and currency markets; (iv) establishing an appropriate model specification for the dynamic heterogeneous panel data model with large T. These features of the nonlinear panel ARDL approach are intuitively appealing in our empirical analysis of the relationship between the real exchange rates and real commodity prices. We estimate our dynamic heterogeneous panel ARDL model using both the mean group estimator (M. Hashem Pesaran & Smith, 1995) and the pool mean group estimator (M. Hashem Pesaran, Pesaran, Shin, & Smith, 1999). These approaches enable estimates of I(0)/I(1) heterogeneous panels for a large sample by jointly estimating both short- and long-term dynamics. For the sake of brevity, we specify only the asymmetric nonlinear panel ARDL model in which we decompose terms of trade shocks into positive and negative partial sums, as follows:

$$TOT_{it}^{+} = \sum_{j=1}^{t} \Delta TOT_{ij}^{+} = \sum_{j=1}^{t} \max\ (\Delta TOT_{ij}, 0) \tag{18}$$

$$TOT_{it}^{-} = \sum_{j=1}^{t} \Delta TOT_{ij}^{-} = \sum_{j=1}^{t} \min\ (\Delta TOT_{ij}, 0) \tag{19}$$

By embedding the equation above, we formulate the nonlinear panel ARDL *(p, q)* as follows:

$$\Delta RER_{it} = \mu_i + \alpha_i RER_{i,t-1} + \psi_i^{+} TOT_{i,t-1}^{+} + \psi_i^{-} TOT_{i,t-1}^{-} + \sum_{j=1}^{p-1} \delta_{ij}\, \Delta RER_{i,t-j} +$$

$$\sum_{j=0}^{q-1} (\theta_{ij}^{+} \Delta TOT_{i,t-j}^{+} + \theta_{ij}^{-} \Delta TOT_{i,t-j}^{-}) + \varepsilon_{it} \tag{20}$$

Where the superscripts (+) and (−) denote the positive and negative partial sums define in Equation (20). The long-run parameters of interest are calculated as $\beta_i^+ = -\psi_i^+/\alpha_i$ and $\beta_i^- = -\frac{\psi_i^-}{\alpha_i}$. p and q refer to the optimal lag orders in the distributed lag component, while μ_i and ε_{it} represent the fixed effects and error terms, respectively.

The error correction version of Equation (20) in which the short-run dynamics of the variables are affected by the deviation from long-run equilibrium can be specified as:

$$\Delta RER_{it} = \tau_i \zeta_{i,t-1} + \sum_{j=1}^{p-1} \delta_{ij} \Delta RER_{i,t-j} + \sum_{j=0}^{q-1} (\theta_{ij}^+ \Delta TOT_{i,t-j}^+ + \theta_{ij}^- \Delta TOT_{i,t-j}^-) + \mu_i + \varepsilon_{it} \quad (21)$$

The error correction term ($\zeta_{i,t-1}$) displays the long-run equilibrium from an asymmetric perspective while its associated parameter (τ_i) measures the error-correcting speed of adjustment.

5.1.5. Interactive Fixed Effects

To explore the effect of CTOT cycles on the cyclicality of fiscal policies, we employ the new class of panel data models with a factor structure specification, which enables the researchers to capture both the interactive effects and the conventional additive effects in the same framework. Taking a cue from the interactive fixed effects initially developed by Bai Jushan (2009), Kneip et al. (2012) provide a new procedure combining principal component analysis and smoothing spline techniques to estimating panel data models with interactive and additive effects. The new class of panel data model proposed by Kneip et al. (2012) may be formulated as follows:

$$y_{it} = \alpha + \beta_i + \Gamma_t + \Sigma_{j=1}^m \theta_j x_{it} + v_i(t) + \mu_{it} \quad \{i = 1, \dots N;\ t = 1, \dots N\} \quad (21)$$

$$v_i(t) = \Sigma_{l=1}^r \lambda_{il} f_l(t) \quad (22)$$

The index i denotes a cross-sectional unit and the index t denotes period. y_{it} represents (the logarithm of) the cyclical component of fiscal items (government tax revenue and government spending) of country i at time t; x_{it} is the vector of explanatory variables

including commodity terms of trade shocks and other control variables in the space $\mathbb{R}^m$; μ_{it} is the idiosyncratic error term. β_i and Γ_t are unobserved additive individual and additive time effects, respectively. $v_i(t)$ represents the time-varying individual effects of country i for the period t. λ_{il} are unobserved individual loadings parameters, $f_l(t)$ are the time-varying common factors, and r is the unknown factor dimension.

The main innovation of the IFE model is that it accounts for time-varying common factors and deals with the problem of unobserved heterogeneity. Controlling for time-varying factors is particularly important because of the nonlinear relationship that characterizes sudden changes in fiscal policy associated with different time-varying and dynamic factors that take place in a time of crisis such as the financial crisis or the recent COVID-19 pandemic. Given that fiscal policy can be exposed to various sources of uncertainties, estimated parameters can be biased if time-varying factors are neglected in the regression model. Another important issue when dealing with the panel data model is related to unobservable individual and time effects. In this analysis, it is important to control for unobservable cross-sectional heterogeneity as it would not be credible to assume that all SSA countries will react similarly to commodity terms of trade shocks. The reaction of fiscal variables would depend on unobservable country characteristics and common factors that influence the pattern of fiscal policy. For instance, over terms of trade cycle, the unobserved preference of policymakers is likely to manifest itself differently. For consistent estimation of the model, it is important to control for such unobservable country characteristics in order to minimize the potential cross-country heterogeneity problem in our model. The flexibility of the IFE models to capture both heterogeneity and time-varying common factors drives the IFE models to become one of the most powerful tools to handle cross-sectional dependence in macro-panel data models.

We expand the previous equation (21), to account for the dynamics in the model. In doing so, we include the lagged dependent variable as an explanatory variable and set the following dynamic panel data model with interactive fixed effects:

$$y_{it} = \alpha + \varphi y_{it-1} + \beta_i + \Gamma_t + \Sigma_{j=1}^{m} \theta_j x_{it} + v_i(t) + \mu_{it} \qquad (23)$$

This type of model captures the dynamic behavior of fiscal variables, commodity terms of trade shocks, and the underlying co-variates. Several papers consider a dynamic panel data model with IFE (N. Lee, Moon, & Weidner, 2012; Moon & Weidner, 2017; Norkutė & Westerlund, 2019).

5.2. Data

In this study, we used three different datasets to investigate the effects of external shocks mediated through CTOT and PCP on financial indicators, real exchange rate, and fiscal stances.

Firstly, we considered a large sample of oil-exporting countries covering different regions in the world in order to capture the global nature of the FRC hypothesis in oil-exporting countries. In doing so, the sample of countries englobes sub-Saharan Africa, the Middle East, and North Africa, Asia, America, and Europe. The countries used to explore the financial resource curse hypothesis are Algeria, Bahrain, Brazil, Canada, Congo, Ecuador, Egypt, Gabon, Ghana, Iran, Kuwait, Mexico, the Netherlands, Nigeria, Norway, Oman, Saudi Arabia, Sudan, Venezuela, the UK, and the US. The experimental period of 1984 to 2016 is long enough for conducting a relevant investigation. It is important to stress that this sample is used only to investigate the financial resource curse paradox in this thesis.

Table B-1 (*see the appendix B*) reports the basic descriptive statistics for the variables under investigation. It is found that domestic credit to the private sector is the financial development indicator with the highest mean. The trend of variation of the median suggests that the median value if quite similar across alternative financial development indicators. This statistic is essential to understand the precise central point. In addition, it is found that the underlying variables are not normally distributed (see Jarque-Bera statistics).[6]

[6] The integrational properties of the variables indicate the presence of unit root in oil price, real per capita GDP, and financial development indicators (credit to private sectors, private credit by domestic banks and other financial institutions and bank deposits). Those series have thus been considered in their first logarithmic differences.

Graphical inspection of the relationship between domestic credit to private sector and oil price fluctuations emphasizes the negative nexus between these variables(Figure 11). This shows that there is no departure from the FRC hypothesis in our sample of oil-exporting countries. However, only a formal analysis can help us to empirically judge the validity of the graphical evidence depicted in Figure 11. To examine the commodity currencies hypothesis across primary commodity exporters in SSA, we rely on different datasets.

Secondly, we rely on monthly data which spans a 15-year period ranging from January 2003 to December 2017 for a sample of twenty-three African countries.[7] The selected countries in this study are Algeria, Angola, Burkina Faso, Burundi, Cameroon, Cote d'Ivoire; Gabon, Ghana, Kenya, Malawi, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Senegal, Sudan, South Africa, Togo, Tunisia, Uganda, and Zambia. The panel members are subdivided according to the main type of commodity exported by each country. In accordance with the IMF's commodity classification system and following previous studies, we establish four subgroups of the panel, notably 8 agricultural raw materials exporting countries (Burkina Faso, Malawi, Mali, Morocco, Mozambique, Senegal, Togo, and Tunisia); 5 energy-exporting countries (Algeria, Angola, Gabon, Nigeria, Sudan), 5 food and beverages exporting countries (Burundi, Cameroon, Cote d'Ivoire, Kenya, and Uganda) and 5 metal exporting countries (Ghana, Mauritania, Niger, South-Africa, and Zambia). These countries eventually represent all African regions.[8] This sample of countries is used to explore the validity of the commodity currency hypothesis.

[7] The time period of our study is long enough to include several commodity price cycles such as the abrupt end in 2011 of the so-called super cycle of metal commodities; the unprecedented drop in oil prices during 2014 and the major increase in the price of major crops between 2007 and 2008 caused by drought and low levels of global stocks.

[8] Table B-2 (in the appendix B) reports the descriptive statistics for every commodity subgroups.

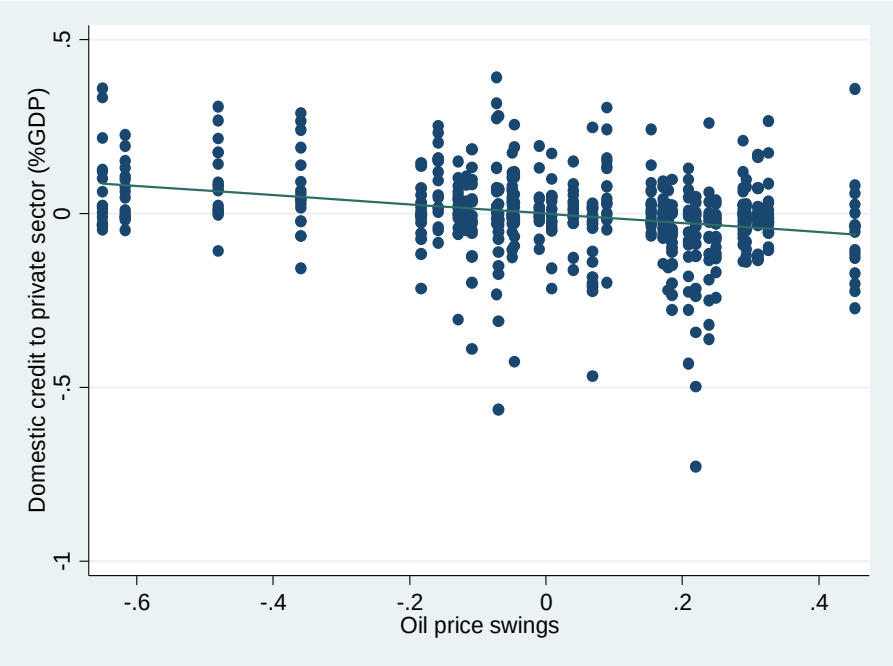

Figure 11. Relationship between oil price fluctuations and financial development.

Finally, we assess the cyclical behavior of fiscal policies (government spending and revenue) to the terms of trade cycles by employing twenty SSA countries over the experimental period restricted to 1985-2017 due to the unavailability of relevant data for a large set of countries.

In this dissertation, we consider again the sample of primary commodity-exporting countries in SSA countries subject to the terms of trade fluctuations. It is particularly important to focus on these countries given the vulnerability of their macroeconomic policies to external shocks mediated through the terms of trade. For this study, the countries under review are Benin, Burkina Faso, Burundi, Central Africa Republic, Comoros, Cote d'Ivoire, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Madagascar, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania, and Togo. The descriptive statistics of the variables are presented in Table B-3 (in Appendix B).

It is important to highlight that SSA countries constitute the main focus of this thesis, although a large set of countries were considered for the analysis of the financial resource curse hypothesis. Such a geographical delimitation of this thesis can be explained by the following two reasons:

(i) most SSA countries suffer from poor macroeconomic performances and several reasons have been advanced to explain this lower performance including, weak institutions, lack of economic diversification, and natural resource mismanagements.

(ii) the importance of theoretical and empirical gaps in the African macroeconomic policy literature. This dissertation provides a new line of reflection on achieving sound macroeconomic policies, which is central for the continent to achieve the SDGs goals.

5.2.1. Dependent Variables

5.2.1.1. Financial Development Indicators

Given the existence of several measures of financial development indicators, we use various measures of financial development including domestic credit to the private sector as a share of GDP, private credit by deposit money banks and other financial institutions as a percentage of GDP, and private credit by deposit money banks and other financial institutions as a percentage of GDP. It is important to consider these indicators of financial development as they capture various dimensions of the financial system. In addition, there are no agreed measures of financial development and by considering these measures we capture several aspects of the financial system such as financial deepness, degree of financial intermediation, and financial efficiency.

Specifically, we use domestic credit to the private sector (%GDP) to measure the ability of banks to issue a credit by deposits to economic agents. This measure has been widely used as a proxy for financial development and it captures the degree of financial intermediation of the banking system. The supply of credit to the private sector is central for economic development in emerging and developing countries as more relaxed credits allow domestic agents to become entrepreneurs and through this credit chain, the economy may be able to reduce income inequality and poverty.

In order to gain some additional insights, we also use alternative indicators of financial development as a share of GDP to capture the ability of commercial banks to perform efficiently their intermediation activities, which consists of matching demand and supply of funds. Such a measure is crucial it underlines the efficiency of the banking system. A perfect match of the demand and deposit indicates that the banking system is more

efficient in exerting their intermediation activities. An important characteristic of the banking system in emerging and developing countries is the lower degree of saving, which prevents access to credits at lower costs. Several factors have been advanced to explain such outcomes including information asymmetries, interest rates not competitive for further saving, and the low use of banking facilities. Finally, we employ bank deposits as a share of GDP to covers three forms of bank deposits, notably demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP. Thus, bank liquidity levels change according to bank deposits. Thus, liquidity of the financial system is determined based on the bank deposits (supply) and a higher ratio indicates less liquidity.

The aforementioned indicators of financial development were retrieved from the same source, namely the Global Financial Development Database (GFD). They yield a broad picture of the financial sector and allows us to check the sensitivity of the estimation results to alternative measures of financial development.

5.2.1.2. Real Effective Exchange Rate Data

We employ the real effective exchange rate data provided by Bruegel and the Bank of International Settlements (BIS) databases in order to have a balanced panel. The utilization of the relatively long time series data allows us to identify such structural shocks in the dynamics of the real effective exchange and commodity prices.[9]

5.2.1.3. Fiscal Policy Indicators

Lately, we rely on fiscal policy variables gathered from the World Economic Outlook Database of the IMF. The sample covers 20 sub-Saharan African countries for which data on government expenditure and government revenues are available over the period 1985-2017. Concerning the measure of fiscal policy behavior, we consider general government expenditures as a percentage of GDP (national currency) and general government tax revenue as a share of GDP (national currency). Government expenditure provides a comprehensive measure of discretionary fiscal policy while government revenues

[9] As can be seen from Table B-3 in Appendix B, we report the existence of several break points/periods in the series.

dependent on the tax base. Thus, these fiscal indicators provide comprehensive insights into the structure of the fiscal policy. Many studies have considered either government expenditures or government revenues when assessing the behavior of fiscal policy. However, we follow a different approach by analyzing the behavior of both fiscal variables.

5.2.2. Main Independent Variable

5.2.2.1. Crude oil prices

The first key variable of interest in this dissertation is the Brent crude oil price index which is retrieved from the BP Statistical Review of World Energy (Allegret et al., 2014). Brent has been widely used as the benchmark of the global crude oil market (Zavadska, Morales, & Coughlan, 2020). This is because 70% of the global tradable oil is denominated on the Brent formula explicitly or implicitly. As a result, we expect Brent crude prices to influence financial variables in countries depending on exports of fuel commodities.[10]

Although a substantial number of empirical studies examined the impact of oil prices on macroeconomic indicators such as economic growth, stock prices and bank performance (Akinsola & Odhiambo, 2020; Altintas & Yacouba, 2018; Hesse, Ahluwalia Edmar Bacha Boediono Lord John Browne Kemal Dervis, Foxley Goh Chok Tong Han Duck-soo Danuta Hübner Carin Jämtin Pedro-Pablo Kuczynski Danny Leipziger, Chair Trevor Manuel Mahmoud Mohieldin Ngozi Okonjo-Iweala Robert Rubin Robert Solow Michael Spence, & Sir Dwight Venner Ernesto Zedillo Zhou Xiaochuan, 2009; Hesse, Poghosyan, Hesse, & Poghosyan, 2009; Nonejad, 2020; Saif-Alyousfi, Saha, Md-Rus, & Taufil-Mohd, 2020; Salisu & Isah, 2017), there are relatively few studies examining the influence of oil prices on financial development indicators.

Unlike several previous studies, this study is the first to consider oil prices instead of natural resource rents to investigate the financial resource curse. We adopt this approach for the following reasons:

[10] We use Brent because most of oil countries in our sample trade at prices closer to Brent than WTI. While both crude oil prices (WTI and Brent) moved in tandem until 2008, it is only since the shale oil booms that they have differed so much.

(i) The increasing wave of financialization of oil markets has caused important swings in the evolution of oil prices. Thus, understanding the connection between changes in oil prices and financial development indicators is central to cope with the possible consequences of financialization for financial development.

(ii) Oil contrary to other non-extractive commodities displays some odd features as oil has been seen as a curse. A substantial volume of studies has demonstrated the negative impact of oil prices on macroeconomic indicators. We complement this strand of the literature by estimating the importance of oil shocks for the financial system in oil-rich economies.

(iii) Given the higher chance of endogeneity associated with the use of natural resource rents, we overcome this issue by considering oil prices, which has been evidenced to be strongly exogenous (Mohaddes & Pesaran, 2017). In addition, this study is the first to examine the financial resource curse hypothesis from the oil price perspectives, unlike earlier studies that focused either on the interest rate channel of the financial curse (Benigno & Fornaro, 2014) or the resource rent dimension of the financial curse. Another strand of the literature focused on the fiscal resource curse in resource-rich countries (Coutinho, 2019; Coutinho et al., 2013; Masi, Savoia, & Sen, 2018; Mosley, 2017).

As a result, we expect Brent crude prices to play an important role in the transmission of world oil prices to financial indicators in oil-exporting countries. More importantly, the original contribution of this thesis to the growing literature on the financial resource curse is that it explores a new dimension of the financial resource curse stemming principally from world oil price shocks.

5.2.2.2. Commodity terms of trade

This study employs a comprehensive database of country-specific commodity terms of trade indices recently provided by Gruss and Kebhaj (2019). This data covers the change in the world price of up to 45 individual commodities and expands the coverage of previous studies by constructing commodity terms of trade indices based on time-invariant weights for a broader sample of individual commodities and covering a longer period. Based on these insights, the authors suggested that the use of this new advanced

commodity terms of trade database is particularly suited to consider the exogeneity of terms of trade index from the perspective of African commodity-exporting countries. As a result, our measure of commodity terms of trade adopted in this analysis perfectly fits the small open economy assumption that is relevant in our panel of developing commodity-exporting countries.

5.2.2.3 Primary commodity prices

All major commodity price indexes including agricultural and raw material price index, energy price index, metal price index, and food and beverage price index are gathered from the IMF Primary Commodity Prices database. The real energy price index is calculated as the simple average of US dollar prices in major markets including West Texas, Brent, and Dubai. The real food and beverage price index include bananas, barley, beef, cocoa, coffee, corn, fish, groundnuts, meal, oranges, lamb, olive oil, palm oil, rice, rapeseed oil, shrimp, soybean oil, sugar, sunflower seed oil, swine meat, poultry, and wheat price indices. The real metal price index includes copper, gold, aluminum, iron ore, lead, nickel, tin, zinc, and uranium price indices. The real agricultural and raw materials price index is composed of all price indices of timber, cotton, hard logs, hides, natural rubber. Soft logs, soft sawn wood, and wool.[11]

5.2.3. Control Variables

(i) Structural policies and institutions: there is widespread recognition that financial development can be impacted by growth. In theory, it was assumed that the financial sector would expand further during episodes of economic expansion. This can be explained by the increasing demand for financial services in light of the expansion of real activity (Ben Naceur, Cherif, & Kandil, 2014). Thus, growth is indispensable for financial development. In fact, economic growth affects finance by influencing the demand for credits, investment, and saving. In addition, high-income countries tend to be characterized by sound financial policies, both in terms of implementation and formulation (Nasreen, Mahalik, Shahbaz, & Abbas, 2020; Song, Chang, & Gong, 2020).

[11] RER, terms of trade and real primary commodity price indices have been transformed in logarithm.

As proxy for economic growth, we use the real GDP per capita, which is extracted from the World Development Indicators (WDI) database.

Another key structural policy area is related to government spending. While public policy intervention is critical in providing the better infrastructure needed to promote financial development, a public intervention can also be an important burden if it causes interest rates to rise and decreases private investments. Whether public spending stimulates or harms financial development remains an important issue in the macroeconomic literature (Bahal, Raissi, & Tulin, 2018; Fu, 2020; Hart & Moore, 1999). The lack of consensus in the existing literature emphasizes the complexity of government intervention (Demetriades & Rousseau, 2010). We expand this strand of the literature by controlling for the role of government spending as a potential driver of financial development in oil-exporting countries.

In addition, real GDP per capita is used as a potential control variable in our regression model of fiscal policy behavior. Theoretically, one expects that government spending goes up with real per capita GDP based on the Wagner's law (Wagner, 1892). According to Wagner's law, government activity through government spending increases as a result of economic growth. One may expect that as the level of income of a country increases the ability and inclination of a country to pay for a higher tax, which increases government revenue. We consider the potential role of government spending in oil-exporting countries where only the small elites have the power to set rules of the financial system. The data for government consumption to GDP is obtained from the World Development Indicators (WDI).

An important area of the structural policy considered in this study is related to political institutions. In this light, we explore the role of democratic accountability, which is portrayed as better accounting standards and regulations by which the liberalization of the financial sector is effective and financial policies cannot be biased in favor of a narrow elite group.[12] The use of this new measure of democratic accountability is quite appealing

[12] One could admit that the set of institutions that make stakeholders accountable matter for financial development than those that prevent the citizens to sanction an elite-biased policy by overthrowing the policy maker in office. This is because a more accountable government would limit some bad behaviors such as a politicized creation of rents associated with barriers to entry to the financial sector, which would lead to the liberalization of the financial sector and reduced the profits earned by the state-owned banks. In such setting, market mechanism would properly work and lead to the supply of credit a cheaper price.

in this study for two reasons: (i) many analysts have considered accountability as key to democratic governance. Recently, some studies have considered this measure of democracy in their study (Bjorvatn & Farzanegan, 2015; Dutta & Roy, 2008; Lacroix et al., 2017). This is mainly because this index covers various components of institutions including competitiveness, law and order, protection of population rights, civil liberties, openness, the type of governance such as dominating/alternating democratic regimes (see ICRG, 2016). Thus, democratic accountability carries a set of political institutions highly relevant for shaping financial policies in emerging and developing countries, in contrast to a measure of democracy based on only one dimension of political institutions. Since democratic accountability encompasses various dimensions of political institutions, it is highly expected that this measure would offer a better understanding of the linkages between institutions and finance. The data is gathered from the International Country Risk Guide (ICRG) which is annually published by the Political Risk Group (PRG). (ii) the choice of this index is partly due to the quality of the data over a long period, starting from 1984 annually. The index ranges from 0 to 6, with a lower score reflecting countries with less democratically accountable institutions and a higher score reflects countries in which the government is accountable for their policies and enjoys strong political institutions.[13]

The fourth area of policy is related to trade openness, which is measured by the sum of imports and exports of goods and services as a percentage of GDP. Theoretically, it has been documented that trade openness can promote financial development by influencing the volume and reducing the cost and risk of credit provided by the banks (Braun & Raddatz, 2005; Rajan & Zingales, 2003; The World Bank, 2018). Several channels have been advanced to explain the linkages between financial development and trade openness: (i) higher levels of openness would have a positive influence on the demand for external finance in countries specializing in the production of financially dependent goods and services. Thus, the financial system would be more developed in countries that specialize and exploit the comparative advantages in financially dependent goods and services

[13] Democratic accountability covers various existing dimensions concerning elements promoting government accountability, political participation, and good governance. Democratic accountability is more complex and more objectively measurable than simply using dummy to code democratic election with 1 and 0 otherwise. Such measure based on binary variables is too restrictive and may not adequately reflect the broad-based definition of democracy considered in this study.

(Almeida & Wolfenzon, 2005; Braun & Raddatz, 2005; Do & Levchenko, 2007). (ii) more openness is generally coupled with higher exposure to external shocks, thus firms tend to mitigate the risk of uncertainty associated with trade openness by increasing the demand for financial services to diversify such risks (Svaleryd & Vlachos, 2002, 2005). Furthermore, trade openness has been also considered as a key driver of fiscal outcomes in commodity-exporting countries. In this light, we control for trade openness in the relationship between commodity terms of trade and fiscal variables. On the one hand, by increasing the exposure of countries to external shocks, trade openness may increase pressure on fiscal outcomes in emerging and developing commodity-exporting countries. Thus, greater trade openness is predicted to hinder the effectiveness of fiscal policy (Karras, 2014). On the other hand, greater openness to international trade is also expected to be helpful (or less detrimental) in balancing the fiscal variables. The intuition is that higher openness tends to display higher levels of competition, less corruption, and more transparency. In such a situation, the fiscal system tends to be more efficient in countries with less corruption and rent-seeking activities (J.-L. Combes & Saadi-Sedik, 2006).

The fifth important area of policy is related to financial globalization to capture the influence of capital flows and stock of foreign assets and liabilities on financial sector development. The index is scaled between 1 (lowest level of globalization) and 100 (highest degree of globalization). The recent wave of financial globalization that has occurred after the global financial crisis has been marked by the elimination of the barriers between countries and the free mobility of capital flows between industrial and some developing and emerging markets. This massive capital flow has been generally accompanied by episodes of significant financial crises that have had substantial macroeconomic challenges (Hellmann, Murdock, & Stiglitz, 2000; Repullo, 2004). According to the conventional neoclassical theory, financial globalization in terms of free capital flows is beneficial as it boots national incomes and financial development indicators (Gaies, Goutte, & Guesmi, 2020; Olasehinde-Williams & Balcilar, 2020). In the context of global imbalances characterized by important capital flows from developed countries toward emerging markets, it is important to control the potential effects of financial globalization on financial development. The financial globalization index has been taken from the KOF Swiss Economic Institute website. It is important to note that we did not make any distinction between the de jure and de facto measures of

globalization. Similarly, we employ FDI to capture the effects of foreign capital inflows in shaping the dynamics of RERs in SSA countries. The bilateral FDI data was collected from a recent database of UNCTAD Statistics.

Furthermore, we employ financial openness in examining the role of financing constraints in shaping fiscal policies in SSA countries. Given that most SSA countries are still a low or medium degree of financial openness, it is important to understand how financial openness can affect fiscal policies in SSA countries. Theoretically, it is expected that a higher degree of financial openness increases the availability and accessibility of foreign funds during episodes of the terms of trade deterioration. In doing so, commodity exporters can smooth out the detrimental effect of the terms of trade shocks and pursuit a sustainable fiscal policy. Empirically, it is reported that financially open countries can easily borrow in episodes of recessions than closed countries (Calderón & Schmidt-Hebbel, 2008; Dong, 2020).

***(ii) Stabilization policy*:** Finally, we consider the lack of price stability characterized by inflation as an important determinant of financial development. Theoretically, it is argued that higher inflation has a negative impact on financial development by reducing returns on savings and savers. (Bittencourt, 2011; Senhadji Semlali & Khan, 2000). With this background, price stability is critical to ensure an effective financial system. As shown by (Rousseau & Yilmazkuday, 2009) a small increase in inflation negatively influences the growth effects of financial development. Over the past decade, several oil-exporting countries have experienced episodes of the higher inflation rate. In such a higher-inflation environment, it is important to examine the possible effect of inflation on financial development indicators in order to illuminate policymakers in implementing sound stabilization policies.

CHAPTER 6

ESTIMATION RESULTS AND DISCUSSION

6.1. FRC Hypothesis in Oil-Exporting Countries

6.1.1. Cross-Sectional Dependence test

Table 1 reports the results of a test for strong cross-section dependence in the data using Pesaran (2015). We see that the null hypothesis of weak cross-section dependence is rejected at the 1% level for each of the datasets. As expected, this outcome implies the existence of common factors affecting the indicators of financial development across countries and validates the use of advanced panel unit root tests.

Table 1. CSD test results based on Pesaran (2015)

Variable	DCPS	Depo.	PCDM	Oil price	GDP	Fin.Glob.	Open.	Gvt.	Demo.
CD	66.427[a]	67.468[a]	52.20[a]	85.977[a]	58.889[a]	73.783[a]	37.842[a]	64.770[a]	36.748[a]
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: DCPS: Domestic credit to the private sector, Depo.: Bank deposits, PCDM: Private credit by deposits money banks; Oil price: UK crude oil prices, GDP: real per capita GDP, Fin.Glob: Financial globalization; Open.: Trade openness; Gvt. Government spending; Demo: Democratic accountability index. CD refers to a cross-section dependence test statistic based on the test in Pesaran (2015). [a] denotes 1% significance level.

6.1.2. Panel Unit Root Test

In order to check the stationarity of the series by employing the second generation panel unit root tests advanced by (Pesaran, 2007).

Table 2. Panel unit root tests

	Level		1st Diff	
	CADF	CIPS	CADF	CIPS
DCPS	-1.450	-0.563	-4.941[a]	-9.236[a]
DPO	-0.568	-1.125	-5.966[a]	-4.562[a]
PCDM	-1.055	-1.852	-9.547[a]	-5.045[a]
Oil price	1.700	-1.010	-2.112[c]	-2.610[a]
GDP	-1.133	-1.033	-4.977[a]	-6.007[a]
Fin Glob	-5.139[a]	-6.112[a]	-15.897[a]	-5.023[a]
Open	-3.830[a]	-2.956[a]	-10.908[a]	-12.320[a]
Gvt	-2.666[c]	-2.896[a]	-7.796[a]	-10.288[a]
Demo	-3.487[a]	-2.947[a]	-4.220[a]	-4.684[a]

Notes: DCPS: Domestic credit to private sector, Depo.: Bank deposits, PCDM: Private credit by deposits money banks; Oil price: UK crude oil prices, GDP: real per capita GDP, Fin.Glob: Financial globalization; Open.: Trade openness; Gvt. Government spending; Demo: Democratic accountability index. [a], [b] denote 1% and 5% significance level, respectively.

Table 2 presents the results of the stochastic properties of the series under investigation by using the CADF and CIPS unit root tests. When the deterministic is intercept and trend, one observation is that crude oil prices, real GDP per capita, and the financial development indicators are non-stationary, while all other variables are stationary at levels. For this reason, crude oil prices, real GDP per capita, and FD indicators (credit to the private sector, private credit by domestic banks and other financial institutions and bank deposits) were converted into their first log differences.

6.1.3. Homogeneity And Non-Remaining Linearity Tests

The first step in the estimation of the PSTR model is the validation of nonlinearity. If linearity is rejected, then there is a smooth transition type nonlinearity. In such a case, the adoption of the panel smooth transition regression model is more suitable to investigate the relationship between oil price fluctuations and FD indicators. In the second step, the number of transition functions should be identified in order to determine whether there is a remaining nonlinearity or not in the PSTRM model. After identifying the number of transition functions, the last step consists in estimating the parameters of the PSTRM model by employing the NLLS techniques and the grid search technique to estimate the threshold level. In this study, the homogeneity and non-remaining linearity tests were conducted using Wald, Fisher, and Likelihood Ratio tests. As depicted in Table 3, the

nonlinearity and the remaining nonlinearity tests were executed for alternative indicators of FD.

Table 3. Homogeneity tests and remaining nonlinearity tests

Model	Domestic credit (%GDP) (first log diff.)		Private credit (%GDP) (first log diff.)		Bank Deposits (%GDP) (first log diff.)	
	Full sample					
Tests	Linearity	r=1 vs r=2	Linearity	r=1 vs r=2	Linearity	r=1 vs r=2
Wald (p-value)	**38.326**[a] (0.000)	4.780 (0.572)	**19.635**[a] (0.003)	7.595 (0.269)	**37.625**[a] (0.000)	1.612 (0.952)
Fischer (p-value)	**6.572**[a] (0.007)	0.735 (0.621)	**3.238**[a] (0.004)	1.194 (0.308)	**6.432**[a] (0.000)	0.248 (0.960)
LR (p-value)	**39.871**[a] (0.000)	4.803 (0.569)	**20.010**[a] (0.003)	7.651 (0.265)	**39.033**[a] (0.000)	1.615 (0.952)

Note: r denotes the number of extreme regimes. r=1 vs r=2: No remaining nonlinearity with one threshold versus no remaining nonlinearity with at least two thresholds. p-values of the test statistics are presented in parentheses. LR is the likelihood ratio.

The nonlinearity and remaining nonlinearity results are reported in Table 3. Based on the Wald, Fisher and the LR tests, the null hypothesis of linearity (homogeneity) is rejected at the 1% level of significance for all alternative measures of financial development under investigation. This result indicates that the PSTR-type panel nonlinear model perfectly captures the relationship between oil prices-financial development-institutions in oil-exporting countries. Thus, one may claim that democratic accountability is the appropriate switching variable in our PSTRM model. These findings are in accordance with the identification strategy of the PSTR models.

Therefore, Table 3 also displays the results of remaining nonlinearity using Likelihood Ratio, Fisher, and Wald tests. The null hypothesis of no-remaining nonlinearity (one threshold) is tested against the alternative of at least two extreme regimes. The simulation results show that the null hypothesis of one threshold cannot be rejected at the conventional level of significance for the underlying measures of financial development. This implies that the specification with democratic accountability as the transition variable is appropriate to examine the relationship between oil prices and financial

development. The PSTR model is characterized by one transition variable (democratic accountability) and two extreme regimes (i.e. weak and good democratic institutions).

On the ground of the specification of the appropriate PSTRM model, the NLLS technique is used to estimate regression coefficients. The two-dimensional grid search technique is used to estimate the threshold parameter c and the speed parameters γ.

6.1.4. PSTRM results

Table 4 reports the results of different models for alternative indicators of financial development. These specifications are insightful as the robustness of the empirical findings is discussed based on different measures of financial development. Table 4 further reveals the estimated threshold levels and the smoothness parameter. From Table 4. It is observed that the estimated threshold levels of democratic accountability are stable and fluctuate around the threshold levels of 1.01 and 1.08.

Specifically, as seen in Table 4, the estimation of the threshold level reveals that the effects of oil prices on FD change for the following threshold levels of democratic accountability 1.01, 1.05, and 1.08 when domestic credit, private credit, and bank deposits are considered, respectively. These outcomes show that the threshold level for democratic accountability is less sensitive to alternative measures of financial development and the transition happens only when the democratic index reached these estimated thresholds. Another important parameter in the panel smooth transition analysis is the smoothness parameter (γ). As discussed earlier, the value of the speed of transition (smoothness parameter) shows the shape of the regime changes, which can be abrupt or smooth over time. The results in Table 4 indicate that the smoothness parameters obtained under different specifications are small, suggesting that the threshold variable (democratic accountability) follows a smooth process over time. This finding highlights the superiority of the panel smooth transition model over the traditional panel threshold regression model.

These findings imply that there is a threshold effect of democratic accountability on the relationship between oil price fluctuations and financial development in oil-exporting countries. A two-regime panel threshold model is appropriate to capture the dynamic

relationship between variables under investigation. Before commenting on the estimation results, it is important to bear in mind that there is a continuum of coefficients between the two extreme regimes characterized by different effects of oil prices on financial development (Yohou, Goujon, & Ouattara, 2016). For this reason, we only interpret the sign of the coefficients of oil prices and other covariates across different regimes.

Table 4. Estimation results of Panel Smooth Transition Regression models (Gonzales et al., 2005, 2017)

Model	Domestic credit (%GDP) (first log diff.)		Private credit (%GDP) (first log diff.)		Bank Deposits (%GDP) (first log diff.)	
			Full sample			
Threshold, c	1.018		1.056		1.083	
Slope, γ	6.877		8.343		8.716	
	regime_1	regime_2	regime_1	regime_2	regime_1	regime_2
Oil price (1st log. Diff.)	-0.346[a]	0.365[b]	-0.400[a]	0.424[a]	-0.328[a]	0.342[a]
	(-4.630)	(2.010)	(-5.274)	(4.150)	(-5.944)	(3.390)
GDP per capita (1st log. Diff.)	-1.731[a]	1.523[b]	-1.571[b]	1.268[c]	-2.026[a]	1.652[b]
	(-2.801)	(2.494)	(-2.257)	(1.985)	(-2.974)	(2.314)
Trade open.	-2.849[b]	3.340[b]	-3.801[a]	4.120[a]	-3.743[a]	4.108[a]
	(-2.151)	(2.883)	(-3.408)	(3.669)	(-2.849)	(3.171)
Fin Glob	0.129	0.196[a]	0.277[b]	0.313[b]	0.0854	0.0871[a]
	(1.142)	(3.347)	(2.041)	(2.112)	(0.734)	(4.325)
Gvt	-0.045	0.008[c]	-0.067[b]	0.003	-0.053[b]	0.014[b]
	(-1.534)	(1.779)	(-2.034)	(0.397)	(-1.985)	(2.052)
Inf	-0.009	-0.013	-0.001[b]	-0.002	-0.001	-0.018
	(-1.362)	(-1.228)	(-2.274)	(-1.317)	(-1.261)	(-1.577)

Notes: t-statistics are presented in parentheses. [a], [b]and [c] indicate the 1%, 5% and 10% significance levels, respectively. The democratic accountability index is considered as a threshold variable across specifications. γ is the slope parameter (or transition speed) and c is the threshold (location) parameter. Fin.Glob. indicates the financial globalization index, and Trade open. represents trade openness.

In Table 4, the time-varying effect of oil prices as well as the outlined covariates are reported. The effect of oil prices on financial development that captures the financial resource curse hypothesis is statistically significant and remains robust across various specifications. Starting with the effects of oil prices, the data shows a nonlinear relationship between oil price fluctuations and financial development indicators. This nonlinearity is conditioned by the degree of democratic accountability. In the first regime

characterized by weak democratic institutions (when democratic accountability index is lower than the estimated thresholds), fluctuations in the oil price are negatively correlated with financial development outcomes. This finding is consonant with the financial resource curse hypothesis observed in countries with poor democratic institutions. In contrast, this observed negative influence of oil prices on financial development disappears in the upper regimes of democratic accountability (when the score of democratic accountability exceeds the estimated threshold levels). Thus, there is a positive correlation between oil price fluctuations and financial development indicators in countries with a strong institutional framework. This implies that the financial resource curse hypothesis evidenced in countries with weak institutions is reversed in the second regime when oil exporters display a strong institutional environment. The attainment of the turning point of democratic accountability is critical to reverse the ferocity of the financial resource curse paradox in oil-exporting countries. More importantly, this insight is consistent with alternative measures of financial development.

These outcomes are insightful as the more oil exporters tend to improve the quality of their institutions, the more the ferocity effects of oil prices on financial development indicators are softened. This confirms the argument that strong democratic institutions matter for an efficient financial system in oil-exporting countries.[14] Thus, only oil exporters with high enough scores of democratic accountability are likely to transform the curse stemming from oil price fluctuations. This highlight the fact that the set of political improvements such as strong enough political system of balance checks and sounder accounting standard triggered by democratic accountability regimes are beneficial for the development of the financial system in oil-rich countries. These findings go in line with the evidence of a severe financial resource curse in commodity-exporting countries with weak democratic institutions (Bhattacharyya & Hodler, 2014; Dwumfour & Ntow-Gyamfi, 2018; Mlachila & Ouedraogo, 2019; Shahbaz, Destek, Okumus, & Sinha, 2019)

[14] There are an infinite number of points from one regime to another and the coefficient of oil price gradually shifts from -0.346 to 0.365 as the status of political institutions improve.

Turning to the determinants of financial development, it is observed that the impact of key triggers of financial development remains statistically significant in the three regression models based on various measures of financial development.

For the impact of economic growth and trade openness, a similar pattern in which better democratic accountability reinforces the effects of trade openness and growth on financial development. As expected, trade and growth are nonlinearly related to financial development. Specifically, trade openness and growth negatively influence financial development in the lower regime of democratic institutions, while better democratic institutions in the upper regime contribute to a positive effect of trade and growth on financial development. The outcomes from this study complement the literature regarding the determinants of financial development. For instance, (Acemoglu, Naidu, Restrepo, & Robinson, 2019; Tabellini & Persson, 2007) show that weak democratic institutions tend to mitigate the growth effects of financial development.[15] The analysis also provides evidence of the beneficial influence of the trade liberalization program observed under democratic institutions. Some analysts reported that democratic improvements shape some institutional changes over time by strengthening commercial interests, rule of law, and property rights (Acemoglu, Johnson, & Robinson, 2005; Bhattacharyya, 2009). These institutional changes due to democratic improvements create a competitive market, which is beneficial for financial development. As reported by (Rajan & Zingales, 2003), the consolidation of a competitive domestic market fosters the demand for financial services, which in turn stimulates the development of the financial system. These insights are consistent with those obtained by Ibrahim and Sare (2018) and Svaleryd and Vlachos (2002). The positive effect of trade openness on financial development in oil-exporting countries with strong institutions is in line with (D. H. Kim, Lin, & Suen, 2010).

Furthermore, the coefficient of government spending that captures the possible effect of fiscal policy on financial development is not robust across both regimes. Specifically, there is a negative correlation between government spending and financial development in the first regime of weak institutions. This negative effect of government remains

[15] This finding is logical and can be explained by the fact that it takes some time for the economy to consolidate enough level of democracy compatible with greater equality in the distribution of income which is central to affect the large segment of the population's investment behavior and thus, their demand for financial services.

significant for the measure of financial development under investigation. In the upper regime of democratic accountability, it is observed that the impact from the government is not statistically robust across various specifications. The impact of government spending on financial development is statistically significant only for the case with private credit as a percentage of GDP as an indicator of financial development. The empirical findings of the negative effect of government spending under weak institutions are mainly due to the crowding-out effects of government spending in oil-exporting countries. Thus, episodes of important capital inflows amplify the intervention of the public sector, which in turn raises interest rates and reduce private investment and financial intermediation activities. Such an outcome is observed in a weak democratic institution environment, as governments are less accountable and conduct less efficient fiscal policy related to revenue stemming from oil price dynamics (Ahmed & Miller, 2000; Aramonte, Jahan-Parvar, & Shugarman, 2019).

Another important trigger of FD is the degree of financial openness. The estimation results indicate that in the low democratic accountability regime, there is a positive correlation between financial globalization and financial development for all indicators of financial development. This positive link remains after the threshold level is passed in all models. This finding confirms the diversification hypothesis holding that more open/globalized financial markets tend to have more funds to flow into their countries, which in turn facilitates banking intermediation activities(Berger, El Ghoul, Guedhami, & Roman, 2017; Bui & Bui, 2019). In addition, the negative impact of inflation is very marginal and close to zero in some cases regardless of the degree of democratic accountability. This emphasizes the detrimental effect of inflation on financial development in oil-exporting countries.

Based on the empirical outcomes, it is important to highlight the following conclusion. (i) democratic accountability remains an important factor in shaping financial development indicators in oil-exporting countries; (ii) the time-varying effects of oil prices and other determinants of financial development are gradual and change across regimes depending on the score of democratic accountability; (iii) weak institutions in oil-exporting countries are responsible for the financial resource curse paradox. (iv) the validation of the financial resource curse is only valid in countries with weak institutions.

6.1.5 Dynamic panel threshold regression

Moreover from the literature regarding the determinants of financial development, the issue of endogeneity remains an important challenge in many empirical analyses. In the analysis of the oil prices-democracy-finance nexus, endogeneity may arise due to the substantial importance (size) of the sampled countries in shaping the dynamics of world oil prices. Given the significant contemporaneous impact of the panel members on world oil price dynamics, there is a high chance to validate the assumption of oil price exogeneity in this analysis. This implies the possibility of reverse causality effects of macroeconomic indicators on oil price dynamics in this study. For instance, financial uncertainty or financial crisis in the countries under review can have a possible feedback effect on movements in international oil prices. As recently evidenced by (Ullah, Akhtar, & Zaefarian, 2018), it is important to reduce the endogeneity bias by adopting more realistic and reliable estimation techniques.

In order to tackle the endogeneity issue from the nonlinear perspective, we re-examine the earlier outcomes by following a dynamic panel threshold approach developed by (Kremer et al., 2013). Unlike the PSTR model, the dynamic panel threshold model extends Hansen's (1999) static model by employing the GMM type estimation strategy to accommodate potential endogenous regressors. As the first stage of this approach, (Kremer et al., 2013) adopt the forward orthogonal deviations transformation technique developed by (Arellano & Bover, 1995) to remove the country's fixed-effects. In the panel data model, it is crucial to eliminate the individual fixed-effects in order to avoid the possible correlation of errors. In the next stage, the two-stage least squares (*2SLS*) is used to estimate the threshold coefficients by minimizing the sum of the squared residuals. Once the threshold level is estimated, the regression coefficients can be estimated using GMM type approach, which is based on the lagged dependent variable as instrumental variables.[16] The GMM approach is effective in dealing with the endogeneity issue in panel data modeling (Ullah, Zaefarian, & Ullah, 2020).

The estimation results using dynamic panel threshold model are reported in Table 5. For the sake of robustness, the empirical results are presented for various measures of

[16] For further details with refer the interested readers to (Kremer et al., 2013).

financial development, namely domestic credit as a percentage of GDP, private credit as a percentage of GDB, and bank deposits as a percentage of GDP. Thus, the outcomes from this analysis can be compared with our baseline findings depicted in Table 4.

Table 5. Estimation results using dynamic panel threshold approach

Model	Domestic credit (%GDP) (first log diff.) [1]		Private credit (%GDP) (first log diff.) [2]		Bank Deposits (%GDP) (first log diff.) [3]	
	Oil exporting countries					
Threshold, c	1.041[a]		1.166[a]		1.187[a]	
95% Conf. Int.	[0.990-1.187]		[1.093-1.876]		[1.093-1.876]	
Slope, γ	0.251		0.149		-0.783	
	(0.182)		(0.133)		(0.188)	
	regime_1	regime_2	regime_1	regime_2	regime_1	regime_2
Oil price (1st log. Diff.)	-0.012	0.026[a]	-0.016[b]	0.053[b]	-0.014	0.034[a]
	(0.672)	(0.003)	(0.025)	(0.013)	(0.562)	(0.000)
Initial	0.089[a]		0.054[a]		0.078[a]	
	(0.000)		(0.001)		(0.010)	
GDP per capita (1st log. Diff.)	-0.252[a]		-0.413[c]		-0.588[a]	
	(0.000)		(0.076)		(0.000)	
Trade open.	0.016		0.147		0.172[b]	
	(0.114)		(0.145)		(0.022)	
Fin Glon	0.022[a]		0.054[a]		0.486[b]	
	(0.010)		(0.004)		(0.026)	
Gvt	-0.061[a]		-0.089		-0.070[b]	
	(0.003)		(0.110)		(0.018)	
Inf	-0.001[a]		-0.002[a]		-0.001[b]	
	(0.000)		(0.006)		(0.016)	
Wald Tests (LM)	78.571[a]		25.206[a]		43.962[a]	
	(0.000)		(0.002)		(0.000)	
Fisher Tests (F)	1203.52[a]		1952.104[a]		1963.412[a]	
	(0.000)		(0.000)		(0.000)	
LRT Tests (LR)	35.741[a]		35.841[a]		48.523[a]	
	(0.000)		(0.001)		(0.000)	

Notes: p-values are presented in parentheses. [a], [b]and [c] indicate the 1%, 5% and 10% significance levels, respectively.

Details of the estimation results are shown in Table 5. The summary of findings from the dynamic panel threshold model shows that the estimation results are strongly consistent with our baseline findings obtained from Table 4. Empirical observation implies that the null hypothesis that the model is linear was rejected strongly at the 1% level of significance for the Wald, Fisher, and likelihood ratio tests. It emerges that the model follows a nonlinear process that can be captured by the panel threshold type nonlinearity.

In addition, the threshold levels of democratic accountability are estimated using the two-stage least squares at a 95% confidence interval.

The estimated threshold levels of democratic accountability are 1.041, 1.166 and 1.187 in models 1, 2 and 3, respectively. These threshold levels of democratic accountability are statistically significant and their values are included in the 95% confidence interval. It is also observed that the threshold levels of democratic accountability are slightly higher than those obtained from the panel smooth transition regression.

In contrast to the panel smooth transition regression, the dynamic panel threshold model provides the time-varying effects of oil prices, while the effects of other covariates are are time-invariant. The regression coefficients were estimated using the GMM framework. In line with our baseline results, oil price fluctuations hurt financial development indicators in countries with weak accountability institutions, while the detrimental effects of oil price decrease with improvements in the institutional framework. These outcomes are consistent with our baseline estimation results obtained from the panel smooth transition regression models. Besides, the coefficient associated with the lagged dependent variable is positive and statistically significant. This is indicative of the inertia effect that legitimates the dynamic specification of the panel threshold model.

Regarding the determinants of financial development, there is a consistent negative correlation between economic growth and financial development indicators. There is a negative and statistically significant impact of growth on financial development across all specifications. This implies that the pursuit of economic development is not effective in stimulating the financial system in oil-exporting countries. This outcome is mainly due to the inefficient allocation of oil windfalls during episodes of oil price booms together with the poor performance of the private sector in the countries under review (Nili &

Rastad, 2007). In addition, there is a positive correlation between trade openness and financial development only in the case of bank deposits (%GDP) as an indicator of financial development. This indicates that trade openness is not effective in improving the financial system in oil-rich countries. In contrast to trade openness, financial globalization positively influences financial development, suggesting that opening the domestic financial market increases bank's liquidity, which in turn fosters their degree of intermediation (Bui & Bui, 2019).

It is also observed that government spending negatively influences domestic credit to the private sector and bank deposits. This is in line with the crowding-out effect of government spending in oil-exporting countries mainly due to higher inefficiencies (Nirola & Sahu, 2019). As expected, inflation continues to have a negative influence on financial development.

6.2. Results of the Relationship Between Commodity Terms of Trade and Real Exchange Rate in SSA Countries

6.2.1. Panel Unit Root Tests

As Table 6 depicts, Bai and Ng (2004) and Lee and Tieslau (2019) tests reject the null hypothesis of a unit root at 1% level of significance in all the real effective exchange rate series regardless of the commodity subgroups. However, the results for primary commodity prices are heterogeneous. Energy and metal commodity prices are found to be non-stationary but this is only verified by Bai and Ng (2004) tests. The results also reveal that real terms of trade, agricultural commodity, and food and beverage commodity price indices are stationary regardless of the panel unit root tests.

The results of the first-generation panel unit root tests, namely Im et al. (2003) and Breitung (2000) reveal mixed outcomes. The results obtained from the whole sample show that commodity terms of trade and the real effective exchange rate are stationary at the conventional significance levels. Considering the results obtained from Breitung (2000), we observe that the RER series are stationary at a level for our four panels namely agricultural and raw materials, energy, metal and food, and beverage panels, while the results from the Im et al. (2003) suggest that the RER series are stationary at level with the exception for the agricultural and raw material and energy panels. Turning to primary

commodity price indices, we find that energy and food and beverage commodity price indices are non-stationary regardless of the type of tests. The Breitung (2000) results seem to reject the null hypothesis of non-stationarity for the agricultural and raw material commodity prices, whereas, the Im et al. (2003) results fail to reject the null hypothesis for the same series. Similarly, Breitung (2000) accepts the null hypothesis that metal commodity price indices are not stationary at level, while Im et al. (2003) test seems to suggest that metal commodity price indices are stationary at the conventional level of significance.

Table 6. Linear and nonlinear panel unit root results

Test method	Whole sample		Agricultural and Raw material exporter		Energy exporter		Metal exporter		Food and Beverage exporter	
	RER	TOT	RER	AP	RER	EP	RER	MP	RER	FP
Level										
IPS W-stat	-3.127[a]	-1.498[c]	0.059	-1.111	-1.128	-0.375	-1.445[c]	-1.445[c]	-2.399[a]	0.436
	(0.000)	(0.067)	(0.523)	(0.133)	(0.116)	(0.353)	(0.074)	(0.054)	(0.008)	(0.668)
Breitung t-stat	-3.719[a]	-2.767[b]	-1.983[a]	-2.569[b]	-4.823[a]	-0.953	-1.992[b]	0.066	3.621[a]	0.0872
	(0.000)	(0.020)	(0.002)	(0.014)	(0.005)	(0.170)	(0.023)	(0.526)	(0.000)	(0.534)
Lee & Tieslau panel-LM	-2.349[a]	-7.002[a]	-19.766[a]	-18.569[a]	-23.157[a]	-13.273[a]	-15.246[a]	-10.065[a]	-11.873[a]	-9.441[a]
	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bai & Ng ($BN_{t\text{-}ADF}$)	160.578[a]	117.044[a]	32.640[a]	28.500[a]	26.300[a]	1.611	26.488[a]	4.861	69.154[a]	21.203[b]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.999)	(0.003)	(0.900)	(0.000)	(0.020)
First Difference										
IPS W-stat	-20.925[a]	-23.025[a]	-7.197[a]	-11.574[a]	-9.735[a]	-11.919[a]	-9.611[a]	-7.966[a]	-10.028[a]	-10.307[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Breitung t-stat	-13.095[a]	-11.330[a]	-7.144[a]	-11.942[a]	-6.340[a]	-7.256[a]	-5.837[a]	-7.753[a]	-6.977[a]	-9.268[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lee & Tieslau panel-LM	-52.235[a]	-61.158[a]	-52.670[a]	-37.943[a]	-32.828[a]	-27.959[a]	-38.297[a]	-28.364[a]	33.988[a]	-23.517[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.0000
Bai & Ng ($BN_{t\text{-}ADF}$)	35.652[a]	143.677[a]	90.794[a]	54.812[a]	69.882[a]	21.203[a]	30.066[a]	7.392[c]	46.657[a]	41.997[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.001)	(0.078)	(0.000)	(0.000)
Pesaran CD test	21.013[a]	33.992[a]	21.284[a]		55.584[a]		15.691[a]		82.488[a]	

Notes: Breitung (2000) suggests the null hypothesis of unit root with common process while the null hypothesis of individual unit root test is considered by the Im et al. (2003) (IPS) tests. Lee and Tieslau (2019) developed the univariate LM unit root tests with two trend breaks in the series; Bai and Ng (2004) PANIC test the presence of unit root in the common and individual components by assuming 2 common factor according to BIC criteria. Our results remain statistically unchanged when estimating with more than 2 common factors. We only report Bai and Ng (2004) ADF t-statistics ($BN_{t\text{-}ADF}$). P-values are in parentheses and significance is denoted by [a] when the p-values is < .01; [b] when the p-value is < .05 and [c] when the p-value is < .10. TOT, AP, EP, MP, and FP are, respectively, commodity terms of trade, real agricultural and raw materials commodity price index, real energy commodity price index, metal commodity price index and food and beverage commodity price index. CD denotes the cross-sectional dependence test developed by Pesaran (2004). The CD is not conducted for individual primary commodity price indices as it is cross section invariant.

Following these results, we draw the following conclusions:

(i) Conventional panel unit root tests provide less evidence for stationarity of the RER compared to advanced panel unit root tests that deal with both cross-sectional dependence and structural breaks in the data generating process. Recognizing the low power of these tests in detecting stationarity in series subject to structural breaks and cross-section dependence, the inferences drawn from these tests might be wrong.

(iii) Our second-generation panel unit root tests allowing for cross-section dependence and structural breaks in the data yield more reliable results. As shown in Table A3 (see Appendix), we identify several sets of breakpoints for the series over 2003:01-2017:12. For instance, in RER series, the majority of the breakpoints occur in early 2005 and during the late 2010s, which is not surprising as these periods reflect important financial stress over the whole financial market (Coudert & Gex, 2010). In addition, we detect some breakpoints corresponding to recent events such as the food crisis in 2008:5; the Arab spring in 2011:02; the collapse of Lehman Brothers in 2008: 09 (see Table B-3 in the Appendix).

(iv) Compared to the results, obtained from Breitung (2000) and Im et al. (2003), one may argue that accounting for structural breaks/nonlinearity and cross-section dependence in the real effective exchange rate series provides more evidence for the stationarity of real effective exchange rates, supporting the purchasing power parity (PPP) hypothesis. Many previous researchers have confirmed the validity of PPP (Achy, 2003; Alba & Park, 2005; Bahmani-Oskooee, Chang, & Lee, 2016; Cuestas & Gil-Alana, 2009; Kılıç, 2011; Kruse, 2011; Yıldırım, 2017; Yoon, Min, & Jei, 2019).

(v) We found that commodity terms of trade, real agricultural commodity price index, and real food and beverage commodity price index are mean-reverting (stationary) via panel unit root tests allowing for cross-section dependence and structural breaks. These findings indicate that shocks are relatively transitory, and these commodities fluctuate around their equilibrium as suggested by the Prebish-Singer hypothesis. Our results are in line with several studies (see e.g. Arezki et al. (2014) (2012) and John Baffes and Etienne, 2016). Besides, we found that energy and metal commodity price indices confirmed the rejection of the Prebish-Singer hypothesis. This finding is remarkably

consistent with Di Iorio and Fachin (2018) for metal commodity prices and Arezki et al. (2012) for energy commodity prices. All these results provide additional evidence in favor of the heterogeneity across primary commodity subgroups.

6.2.2 Symmetric versus asymmetric cointegration results

In order to reach more reliable outcomes, we conduct both symmetric and asymmetric cointegration analyses. As discussed previously, we rely on the linear/symmetric panel cointegration tests developed by Westerlund (2007) since our series exhibit cross-sectional dependence. The results depicted in Table 7 indicate that there is no linear/symmetric cointegration between RER and commodity terms of trade in the whole sample as well as across primary commodity subgroups. The absence of linear cointegration between variables is indicative of the existence of hidden cointegration between the underlying positive and negative components of the series. To this end, we employ the procedure advanced by Hatemi-J (2018) to test for asymmetric cointegration. As depicted in Table 7, we find strong evidence for the existence of a long-run relationship between the negative and positive components of the series, as the residuals are all stationary at level. Thus, one may conclude that there exists an asymmetric structure between commodity and currency markets. This finding has three keys implications: (i) allowing for asymmetry is crucial to perfectly model the long-run relationship between currency and commodity markets; (ii) linear/symmetric cointegration tests are so restrictive to capture dynamics linkages between currency and commodity markets and may lead to inaccurate results and; (iii) asymmetric adjustments do occur to ensure long run equilibrium in the system. Since we find evidence of asymmetric cointegration between the variables, we then continue our analysis by estimating the asymmetric panel ARDL results.

Table 7. Symmetric and Asymmetric panel cointegration results

	Westerlund (2007) Panel cointegration results		Hatemi-J (2018) Hidden cointegration results		
	Stat.	Bootstrap p-value		H0: I(1); H1: I(0)	p-value
Whole sample					
Gt	-1.302	0.959	$(RER^+, TO$	-15.271[a]	0.000
Ga	2.059	0.123	$(RER^+, TO$	-12.115[a]	0.000
Pt	-0.817	0.470	$(RER^-, TO$	-14.493[a]	0.000
Pa	0.318	0.475	$(RER^-, TO$	-12.325[a]	0.000
Agricultural and raw materials					
Gt	-5.148[b]	0.020	$(RER^+, AP$	-7.070[a]	0.000
Ga	3.713	0.998	$(RER^+, AP$	-8.153[a]	0.000
Pt	-1.400	0.370	$(RER^-, AP$	-6.525[a]	0.000
Pa	2.580	0.996	$(RER^-, AP$	-10.562[a]	0.000
Energy					
Gt	-0.768	0.484	$(RER^+, EP$	-2.606[a]	0.004
Ga	2.862	0.997	$(RER^+, EP$	-6.810[a]	0.000
Pt	-1.162	0.441	$(RER^-, EP$	-3.786[a]	0.001
Pa	2.054	0.993	$(RER^-, EP$	-4.551[a]	0.000
Metals					
Gt	0.047	0.635	$(RER^+, MI$	-8.435[a]	0.000
Ga	-1.910	0.592	$(RER^+, MI$	-5.060[a]	0.000
Pt	-0.600	0.558	$(RER^-, MI$	-5.202[a]	0.000
Pa	-3.225	0.479	$(RER^-, MI$	-8.090[a]	0.000
Food and Beverages					
Gt	-3.170[c]	0.089	$(RER^+, FP$	-6.028[a]	0.000
Ga	2.336	0.981	$(RER^+, FP$	-6.616[a]	0.000
Pt	-1.519	0.154	$(RER^-, FP$	-5.738[a]	0.000
Pa	1.469	0.962	$(RER^-, FP$	-5.483[a]	0.000

Notes: Gt, Ga, Pt and Pa represent the cointegration test of Westerlund (2007). TOT, AP, EP, MP, and FP are, respectively, commodity terms of trade, real agricultural and raw materials commodity price index, real energy commodity price index, metal commodity price index and food and beverage commodity price index. Significance is denoted by [a] when the p-values is < .01; [b] when the p-value is < .05 and [c] when the p-value is < .10.

6.2.3 Asymmetric Panel ARDL Results

As a consequence of the asymmetric cointegration exhibited between the series, there cannot be a linear/symmetric long run and short run responses of the real exchange rates to changes in terms of trade and commodity prices.[17] Accordingly, we model the asymmetric responses of the RER to terms of trade and primary commodity prices over different time horizons by following the methodology presented by Shin et al. (2014). We use two different estimators namely the mean group (MG) and pooled mean group (PMG) to estimate the relationship between the RER and shocks in commodity markets and thereafter we subject these estimators to the familiar Hausman-type test. When comparing these estimators, the null hypothesis implies that the PMG is preferred while the rejection of null hypothesis suggests that the adoption of the MG estimation. In this study, the null hypothesis of the Hausman could not be rejected and therefore the PMG estimation are preferred over the MG for modelling the dynamics of the RER across various specifications. As reported in Table 4 the choice of the PMG is consistent for modelling the relationship between the RER and various types of commodity prices namely agricultural and raw material, energy, metal and food and beverages prices. To this end, Table 8 provides the empirical findings based on the PMG estimates of the asymmetric effects of commodity prices on the RER for the whole sample and the four sub-samples (agricultural and raw material, energy, metal and food and beverages exporting countries). We start by discussing the estimation results of the relationship between RER and commodity terms of trade for the whole sample of 23 African economies and later, we investigate the relationship between the RER and the four primary commodities to capture the change in the behavioral relationship between fluctuations in the real commodity price indices and the movements in the real effective exchange rates. In the following subsections, we discuss our empirical outcomes presented in Table 8.

[17] In view of the fact that we find evidence of asymmetric cointegration between currency and commodity markets, it may be argued that our model follow a non-linear/asymmetric error correction path. This provides additional evidence for the use of the nonlinear panel ARDL model.

Table 8. Nonlinear panel ARDL regression results

Variable	Whole sample	Agricultural and Raw materials	Energy	Metals	Food and Beverages
ECT	-0.069[a]	-0.066[a]	-0.075[a]	-0.070[a]	-0.077[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TOT^{+}	0.281[a]				
	(0.010)				
AP^{+}		-0.002			
		(0.939)			
EP^{+}			0.241[b]		
			(0.032)		
MP^{+}				0.111[c]	
				(0.056)	
FP^{+}					0.031
					(0.591)
TOT^{-}	0.172[a]				
	(0.001)				
AP^{-}		0.124[b]			
		(0.040)			
EP^{-}			0.114[a]		
			(0.002)		
MP^{-}				0.081[a]	
				(0.006)	
FP^{-}					0.079[b]
					(0.012)
ΔTOT^{+}	0.0729				
	(0.679)				
ΔAP^{+}		0.021			
		(0.570)			
ΔEP^{+}			-0.015		
			(0.415)		
ΔMP^{+}				0.028	
				(0.596)	
ΔFP^{+}					0.194[c]
					(0.083)
ΔTOT^{-}	-0.327[b]				
	(0.025)				
ΔAP^{-}		-0.127[b]			
		(0.040)			
ΔEP^{-}			-0.054[b]		
			(0.018)		
ΔMP^{-}				-0.023	
				(0.833)	
ΔFP^{-}					-0.030
					(0.723)
$Constant$	0.315[a]	0.304[a]	0.338[a]	0.316[a]	0.351[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Log likelihood	10593.622	4022.7248	2132.0736	2048.4599	2417.0254
Hausman test	1.07	0.99	0.06	2.92	0.54
	(0.586)	(0.608)	(0.970)	(0.231)	(0.763)
No of countries	23	8	5	5	5
Obs.	4.340	1440	900	900	900

Notes: Δ indicates short run estimations; TOT, AP, EP, MP, and FP are, respectively, commodity terms of trade, real agricultural and raw materials commodity price index, real energy commodity price index, metal commodity price index and food and beverage commodity price index. Significance is denoted by [a] when the p-values is < .01; [b] when the p-value is < .05 and [c] when the p-value is < .10. ECT denotes the error correction terms, ECT is negative and significant confirming the asymmetric cointegration between RER and commodity markets.

6.2.4. Effects Of Commodity Price And Terms Of Trade Shocks On Real Effective Exchange Rates

6.2.4.1. RER And Commodity Terms of Trade Shocks

In the long run, up and down cycles in TOT (corresponding respectively to TOT improvement and deterioration) exert a positive and significant effect on the RER, although the magnitude is larger for ascending than descending movements in TOT. This implies that RERs of commodity-exporting countries in Africa are TOT elastic in the long run irrespective of whether shock in commodity terms of trade is positive or negative. This behavior of the real exchange rate in the long term is mostly due to the higher dependence of these countries on the exports of primary commodities. These findings are in line with the results of several previous studies obtained by (Boubakri et al. 2019; Cashin et al. 2004; Chen and Rogoff 2003; Coudert et al. 2015). Also, according to the results, in the short run, only negative changes in terms of trade (corresponding to TOT deterioration) exert a negative and significant effect on the RER, the effects of positive changes corresponding to an improvement in the TOT show no significant relationship.

Following these results, one may conclude that most of the African economies seem to experience a real appreciation following terms of trade volatilities (positive and negative changes) in the long run. Therefore, these economies will suffer a long-run real appreciation of their currencies following terms of trade volatilities. In the long run shocks in terms of trade put the real exchange rate under-appreciation pressures which may lead to a loss of competitiveness and negatively influence exports, investment, and output. In the short run, the RER of these economies is more exposed to negative terms of trade shocks than positive ones, which would cause a real depreciation. Under such circumstances of real depreciation and weaker foreign capital inflows, policies that tend to focus on imports rather than exports can be implemented to adjust the external balances in the short term. In addition, certain interventions such as foreign exchange interventions, capital account regulations, diversification efforts, reallocation of the domestic demand towards locally produced goods and the promotion of domestic manufacturing sectors are essential to mitigate a real appreciation pressure in the long run and consolidate a more competitive and stable RER (Guzman, Ocampo, & Stiglitz, 2018).

6.2.4.2 RER and Agricultural, and Raw Material Commodity Price Index

For the agricultural and raw material panel, we find that RER responds significantly to negative shocks in agricultural and raw material prices than positive ones in the short and long terms. In the short run, there is a real depreciation of agricultural commodity exporters' RER following negative agricultural commodity price shocks, which is in line with the prediction of the demand-side effect suggesting that decreases in demand for agricultural commodity exports driven by the downward trend in the global economy (slowing of growth in emerging countries) may lead to the capital account or balance of payment deficit and drive down the supply of foreign exchange causing a real depreciation of the domestic currency. However, with time, in the long run, the real exchange rate tends to respond positively as the negative shocks persist in the long run. This implies that the persistent slowdown of agricultural commodity prices has a real appreciation effect in the long run. As discussed above, the appreciation of the RER will cause a loss of competitiveness, which may lead to the so-called Dutch disease phenomenon. Our finding also reveals that only negative shocks to agricultural commodity prices have a long-lasting effect on the RER. This behavior of agricultural commodities can be partly explained by the downward trend in the agricultural commodity price and the central role of agricultural commodities for food security in Africa (Y. C. Chen, Turnovsky, & Zivot, 2014; Durevall, Loening, & Ayalew Birru, 2013). It is crucial for policymakers to be aware of the asymmetric effects of negative changes in agricultural commodity prices on the RER to adopt various exchange rate policies over different time periods.

6.2.4.3. RER and Real Energy Commodity Price Index

In the short run, the real exchange rates respond negatively to negative shocks in the energy price, while in the long-run, both positive and negative energy price shocks exert a positive influence on the real exchange rate in the panel of energy exporting countries; however positive shocks cause a more pronounced effect than the negative ones. Like for the terms of trade case, the RER of energy exporting countries are energy price elastic in the long run irrespective of whether the energy price shock is negative or positive. The energy exporters' exchange rate series respond positively to energy price shocks in the long run. The results seem to be consistent with the intuition that oil price volatilities lead

to destabilizing behavior in the foreign exchange market (Nusair & Olson, 2019). In the short run, however, real exchange rates respond significantly to negative energy price shocks than positive shocks, indicating that only negative shocks in oil prices significantly matter for the real exchange rate movements. This, by implication, provides substantial evidence in favor of the asymmetric responses of RER in both the short-run and long-run relationships. These results corroborate the energy currency effect advanced by Dauvin (2014) suggesting that currencies depreciate when the price of energy falls and appreciate during upswing episodes in energy markets. Based on these results, central banks and policymakers can implement appropriate policies to serve as a cushion especially during the long run to mitigate the negative impact of exchange rate appreciation triggered by energy price volatilities.

6.2.4.4 RER and Real Metal Commodity Price Index

RER responds positively to negative and positive shocks in real metal commodity prices in the long run with different magnitudes, while the effect of metal commodity prices is not statistically significant in the short run. These findings underscore the existence of the metal currency effect suggesting that when the metal price goes up (down) there is an appreciation (depreciation) of the currencies in countries dependent on the exports of metal commodities. Consequently, we conclude that metal commodity prices exhibit the same behavior as terms of trade in the long run, which is in line with our baseline estimation results. Other studies such as Sari et al. (2010) found similar results regarding the long run overreaction of the exchange rate market to metal commodity prices. Consequently, the long-run dynamics of metal commodity prices deserve more attention to stabilize currency markets and mitigate the real appreciation pressure on the currency market.

6.2.4.5 RER and Real Food And Beverage Commodity Price Index

The results show that positive and negative shocks in food and beverage commodity prices have a positive and significant impact on the exchange rate over different time horizons. Particularly, positive changes in real food and beverage commodity prices lead to real exchange rate appreciation in the short run. This finding is in line with the supply-side effect suggesting that the large foreign capital inflows resulting from higher

commodity prices lead to the real exchange rate appreciation. This hypothesis is valid for the case of food and beverage commodity-exporting countries. Surprisingly, we find that negative changes in food and beverage commodity prices lead to an appreciation of the real effective exchange rate in the long run, which conflicts with the prediction of the commodity currency hypothesis. Based on the commodity currency hypothesis one may expect a depreciation of the real exchange rate following a decrease in food and beverage commodity prices. Interestingly, we notice that the long-run appreciation of the real exchange rate in response to negative shocks in the food and beverage commodity prices is relatively lower compared to the real appreciation of the real exchange rate following positive in food and beverage commodity prices observed in the short run. The main implication of this finding is that central banks should place more weight on the use of macro prudential policies to stabilize the exchange rate in the short run compared to the long run.

6.2.5. Sensitivity of the Nonlinear Panel ARDL Regression Results to the Lag Order

As suggested by Chudik et al. (2015), the lag order should be long enough for the consistency of the panel ARDL approach. In this light, we evaluate the sensitivity of the aforementioned results by increasing the lag length by one. The results presented in Table 9 show that our findings are robust to lag length. From Table 9, we report that our baseline conclusion holds, although, it is hard to achieve the magnitude of the estimates of our baseline results. We get similar responses of RER to terms of trade and primary commodity price shocks. Interestingly, we find that RER responds negatively to the lagged negative shocks in food and beverages prices (ΔFP_{t-1}^{-}). This suggests that a downward trend in world food and beverage prices leads to uncompetitive exchange rates in countries exporting food and beverages partly because most of these countries are a net importer of food and agricultural products despite their vast agricultural potential. The decline in world food prices is making the import of certain types of food products more beneficial than their domestic production. Therefore, persistent food import will reduce foreign exchange reserves and aggravate real depreciation without resolving food insecurity. Similar to our baseline findings, one may argue that the effects of terms trade and primary commodity shocks vary across commodity subgroups. The heterogeneity in the responses of the RER to terms of trade and commodity price shocks could be

attributed to the share of primary commodities in the economy (the degree of economic diversification) and the exchange rate regime (fixed/flexible) in the country. For instance, the open-economy macro models predict that a flexible exchange rate regime can be effective in handling the terms of trade shocks because the exchange rate adjusts immediately to the shocks.

Table 9. Nonlinear panel ARDL estimation results with higher lag order

Variable	Whole sample	Agricultural and Raw materials	Energy	Metals	Food and Beverages
ECT	-0.070[a]	-0.065[a]	-0.075[a]	-0.067[a]	-0.080[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
TOT^+	0.151[b]				
	(0.017)				
AP^+		-0.037			
		(0.347)			
EP^+			0.277[b]		
			(0.038)		
MP^+				0.118[c]	
				(0.056)	
FP^+					0.007
					(0.890)
TOT^-	0.216[a]				
	(0.006)				
AP^-		0.204[a]			
		(0.003)			
EP^-			0.011[b]		
			(0.015)		
MP^-				0.200[a]	
				(0.004)	
FP^-					0.292[a]
					(0.007)
ΔTOT^+	0.035				
	(0.850)				
ΔTOT^+_{t-1}	0.126				
	(0.220)				
ΔAP^+		0.031			
		(0.648)			
ΔAP^+_{t-1}		0.021			
		(0.727)			
ΔEP^+			-0.039		
			(0.171)		
ΔEP^+_{t-1}			-0.034		
			(0.102)		
ΔMP^+				0.019	
				(0.708)	
ΔMP^+_{t-1}				0.010	
				(0.195)	
ΔFP^+					0.087[b]
					(0.043)
ΔFP^+_{t-1}					0.002[c]
					(0.099)
ΔTOT^-	-0.415[b]				
	(0.027)				
ΔTOT^-_{t-1}	-0.003[a]				
	(0.088)				
ΔAP^-		-0.184[a]			
		(0.001)			
ΔAP^-_{t-1}		-0.068[b]			

		(0.020)			
ΔEP^{-}			-0.020[c]		
			(0.076)		
ΔEP^{-}_{t-1}			-0.056[c]		
			(0.061)		
ΔMP^{-}				-0.0181	
				(0.854)	
ΔMP^{-}_{t-1}				-0.008	
				(0.774)	
ΔFP^{-}					-0.062
					(0.412)
ΔFP^{-}_{t-1}					-0.500[b]
					(0.045)
$Constant$	0.317[a]	0.299[a]	0.340[a]	0.301[a]	0.351[a]
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Log likelihood	10569.661	4010.8007	2129.211 8	2045.05 6	2408.872
Hausman test	1.04	0.15	0.25	1.48	0.25
	(0.594)	(0.927)	(0.884)	(0.478)	(0.882)
No of countries	23	8	5	5	5
Obs.	4.340	1440	900	900	900

Notes: Δ indicates short-run estimations; TOT, AP, EP, MP, and FP are, respectively, real terms of trade, real agricultural and raw materials commodity price index, real energy commodity price index, metal commodity price index and food and beverage commodity price index. Significance is denoted by [a] when the p-values is < .01; [b] when the p-value is < .05 and [c] when the p-value is < .10. ECT denotes the error correction terms.

6.2.6. Additional Issues

Over the past decades, many African countries have experienced a large amount of foreign direct investments (FDI) and capital inflows from emerging economies notably China, India, and Turkey. We believe that effective decisions about exchange rate policy should consider the implications of this massive influx captured by FDI on the nexus between commodity and currency.

With this background, we controlled for the role of FDI in our baseline regression. This enabled us to explore the implications of FDI on the dynamics of RERs across commodity subgroups. In addition, the magnitude of the estimated coefficients of CTOT and primary commodity price shocks yielded indications about the risks of real appreciation/depreciation when controlling for the massive FDI inflows. The comparison of the magnitude of CTOT and primary commodity price shocks with our baseline findings without FDI depicted in Table 8, allowed us to discuss whether the inclusion of FDI masks or amplifies the impact of CTOT and primary commodity price fluctuations. More importantly, the outcomes obtained from this analysis complements the literature on the impact of financial globalization on the dynamics of RER with respect to terms of trade and PCP shocks.

In order to evaluate the relevance of financial globalization, we employed annual data for the underlying variables over the period 1990 to 2017.[18] One observation from Table 10 is that FDI positively and significantly affects the dynamics of RER only in the short-run, suggesting that the effects of FDI are short-lived. The estimated coefficient is almost zero across subpanels except for the case of energy commodity-exporting countries where the impact from FDI is more pronounced, indicating some risks of real appreciation in energy-exporting countries. These outcomes made us confident that foreign investment inflows have a less harmful effect on the dynamics of RER across commodity-exporting countries in Africa. This is in line with the argument that the macroeconomic effects of FDI depend on whether the inflows have as counterpart an influence in the current account balance (Ibarra, 2011; Vittorio & Leonardo, 1996). For instance, when capital inflows are accumulated in the form of reserves, there will be no change in the current account deficit and presumably, no real exchange rate adjustment is likely to be required. In such a situation, the impact of FDI is insignificant and economically close to zero. This is a theoretical argument in support of the less harmful impact of FDI on individual currencies, which is evidenced in this study.

[18] Due to the lack of monthly data for FDI, we used annual data of RER, CTOT, primary commodity prices and FDI. It is important to note that only the data for FDI were collected from World Development Indicators, while the other variables were gathered from the same source described in the Data section.

Table 10. Sensitivity of the nonlinear panel ARDL results to FDI inflows

Variable	Whole sample	Agricultural and Raw materials	Energy	Metals	Food and Beverages
ECT	-0.204[a]	-0.357[a]	-0.329[c]	-0.248[a]	-0.502[b]
	(0.000)	(0.002)	(0.067)	(0.004)	(0.026)
TOT^+	0.467[b]				
	(0.020)				
AP^+		-0.076			
		(0.462)			
EP^+			0.410[b]		
			(0.000)		
MP^+				0.346[a]	
				(0.003)	
FP^+					0.321
					(0.291)
TOT^-	-0.401[b]				
	(0.023)				
AP^-		-0.136[b]			
		(0.025)			
EP^-			-0.085[c]		
			(0.057)		
MP^-				-0.053[a]	
				(0.001)	
FP^-					-0.289
					(0.539)
FDI	0.004	0.013	0.692	0.036	0.003
	(0.113)	(0.134)	(0.159)	(0.844)	(0.770)
ΔTOT^+	0.377				
	(0.626)				
ΔAP^+		0.188[b]			
		(0.046)			
ΔEP^+			-0.523		
			(0.220)		
ΔMP^+				0.098	
				(0.509)	
ΔFP^+					0.060[c]
					(0.072)
ΔTOT^-	0.055				
	(0.141)				
ΔAP^-		0.445[a]			
		(0.000)			
ΔEP^-			0.069		
			(0.108)		
ΔMP^-				-0.058[a]	
				(0.000)	
ΔFP^-					-0.041
					(0.162)
ΔFDI	0.023[b]	0.001[a]	0.823[c]	0.016[b]	0.002
	(0.012)	(0.000)	(0.066)	(0.045)	(0.127)
Constant	1.594[a]	0.510[a]	0.017	0.207[a]	0.729[b]
	(0.000)	(0.000)	(0.928)	(0.002)	(0.025)
Log likelihood	698.8053	349.2825	148.344 3	210.34 2	175.9583
Hausman test	1.92	1.35	1.01	1.06	1.40
	(0.383)	(0.250)	(0.314)	(0.289)	(0.261)
No of countries	23	8	5	5	5
Obs.	510	152	96	97	96

Notes: Δ indicates short run estimations. TOT, AP, EP, MP, and FP are, respectively, real terms of trade, agricultural and raw materials commodity price index, energy commodity price index, metal commodity price index and food and beverage commodity price index. Significance is denoted by [a] when the p-values is < .01; [b] when the p-value is < .05 and [c] when the p-value is < .10. ECT denotes the error correction terms.

In the next step, we checked whether after controlling for the influence of FDI, if the terms of trade and commodity price shocks still played a significant role in the real appreciation/depreciation across commodity subgroups. From Table 10, we observed similar dynamics of RER across commodity subgroups. However, the estimated coefficients of the terms of trade and PCP shocks had the expected sign and were slightly similar to the findings from Table 8 (when FDI is excluded). The notable difference is that the magnitude of the estimated coefficients is more pronounced, in absolute value than those obtained from Table 4. This is indicative that there are some statistical benefits of including FDI in the regression model. Overall, our empirical evidence lends support that the massive influx of foreign capital through FDI has contributed to amplifying some of the impacts of the terms of trade and primary commodity price shocks on the dynamics of RERs across CECs in Africa. Based on this finding, one may argue that the recent wave of financial globalization in several developing countries has amplified the impacts from the terms of trade and commodity price shocks on the dynamics of real exchange rates across African countries.

6.3. Effects of Commodity Terms of Trade Shocks on Fiscal Outcomes

6.3.1 Cross-Sectional Dependence

In the first step of macro panel data analysis, we check the existence of CSD in the data. This test will help us to decide whether first-or-second generation econometric methods will be used in the analysis. Commodity-exporting countries in SSA are likely to be cross-sectionally dependent mainly due to similarity in their economic structure. To check the presence of CSD across panel members, we employed the cross-sectional dependence test developed by (M. Hashem Pesaran, 2015).

Table 11. Cross-sectional dependency results

	TOT	GRV	GEX	OPEN	FINOP
CSD	17.755[a]	47.723[a]	50.561[a]	45.524[a]	14.111[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: [a] denotes significance level at 1%.

The results from the CSD tests reported in Table 11, strongly reject the null hypothesis that innovations to the underlying variables are cross-sectionally independent.

Confirming the presence of cross-sectional dependence in the series, the next step is to perform the unit root testing.

6.3.2 Panel Unit Roots

To deal with the problem of CSD, we employed the second generation panel unit root tests. We applied the CADF and CIPS tests of (Pesaran, 2007) to check the integrational properties of the variables. The CADF and CIPS tests account for cross-country heterogeneity and test the null hypothesis of a unit root against the alternative that at least one-panel member's series is stationary.

Table 12. Panel unit root results

	Level		1st Difference	
	CADF	CIPS	CADF	CIPS
TOT	-3.809[a]	-4.587[a]	-10.807[a]	-7.135[a]
GRV	-1.367	-1.261	-9.808[a]	-3.963[a]
GEX	-0.275	-3.430[a]	-9.962[a]	-4.148[a]
OPEN	-0.768	-4.043[a]	-2.441[b]	-6.060[a]
FINOP	0.118	-3.597[a]	-7.285[a]	-5.667[a]

Note**: [a], [b]** and [c] show the significance level at 1%, 5% and 10%, respectively.

From Table 12, we can notice a mix stationary and nonstationary variables, Specifically, the null hypothesis of nonstationarity is rejected only for the terms of trade, suggesting that shocks to the terms of trade are not permanent. This finding indicates that shocks are relatively transitory, and these commodities fluctuate around their equilibrium as suggested by the Prebish-Singer hypothesis. However, the evidence provided by the CADF and CIPS panel unit root tests shows that all the variables become stationary when taking the first difference.

6.3.4. Interactive Fixed Effects Results

6.3.4.1. Degree Of Fiscal Procyclicality

Table 13 shows the cyclical behavior of government spending and government tax revenue based on different detrending methods. Before proceeding with the estimation results, it is important to bear in mind that the estimated value of the coefficient on CTOT

represents the degree of fiscal pro-cyclicality. A positive (negative) coefficient means that the fiscal stance is pro-cyclical (counter-cyclical) with respect to the terms of trade.

We estimated two sets of panel IFE regressions to meaningfully addressed the unobservable country-specific and time effects in our panel analysis. We followed the detrending procedures suggested by (Calderón, Duncan, & Schmidt-Hebbel, 2016) based on the HP and the Band-Pass filter to capture the true relationship between fiscal stances and terms of trade in the cyclical frequency. These approaches have been widely in the estimation of policy rules (Frankel et al., 2013; Niemann & Pichler, 2020; Reicher, 2012; Talvi & Végh, 2005). Moreover, the estimated coefficients show that the elasticity coefficients from HP filter are larger in magnitude than those obtained from the BP filter. Our Band-Pass filter estimates are preferred to those using the Hodrick-Prescot filter because the former is capable of isolating both low and high frequencies from the data generating process and provides a more precise estimation for CTOT.

Starting with the results for government spending cyclicality, one observation is that it is robustly and positively influenced by movements in commodity terms of trade irrespective of whether the detrending procedure is based on HP or BP filters. More specifically, government spending is found to be strongly procyclical under HP, whereas, according to BP, government spending is found to be weakly procyclical. This highlights the sensitivity of our estimated coefficients to the underlying filtering techniques.

Table 13. Effects of the terms of trade cycle on the cyclicality of fiscal policy

	Cyclical degree of government expenditure				Cyclical degree of government revenue			
	HP filter	HP filter	BP filter	BP filter	HP filter	HP filter	BP filter	BP filter
L.gex	0.782[b]	0.789	0.762[c]	0.768[c]				
	(0.029)	(0.410)	(0.082)	(0.000)				
L.grev					0.368[a]	0.391[a]	0.837[a]	0.843[a]
					(0.000)	(0.000)	(0.000)	(0.000)
TOT	0.180[c]	0.176[c]	0.101[c]	0.142[a]	0.054[a]	0.090[b]	0.002[b]	0.006[c]
	(0.081)	(0.089)	(0.095)	(0.001)	(0.004)	(0.037)	(0.024)	(0.076)
	(0.021)	(0.785)	(0.006)	(0.006)	(0.047)	(0.001)	(0.046)	(0.019)
Intercept	0.105	0.106	0.790[a]	0.770[b]	0.339	0.196	0.393[c]	0.717
	(0.396)	(0.943)	(0.000)	(0.037)	(0.764)	(0.818)	(0.050)	(0.249)
Add. Eff.	None	Two-way	None	Two-way	None	Two-way	None	Two-way
Factor Dim.	2	1	2	1	2	1	2	1
R squared	0.516	0.559	0.978	0.977	0.942	0.985	0.954	0.954

Notes: The p-values are presented under the parentheses. [a], [b] and [c] depict the statistical significance levels at 1%, 5% and 10%, respectively. Under the none, we omit the additive fixed effects while the two-way strategy considers individual-time effects and additional additive time fixed effects with the IE models.

The rationale behind the pro-cyclical behavior of government spending with respect to the terms of trade is that movements in commodity terms of trade are likely dictates the supply and demand for public goods in low-income commodity-dependent countries. First, an improvement in the terms of trade will have significant distributional consequences as the presence of surpluses increases the government propensity of providing public goods and services. Thus, government spending will tend to increase with the terms of trade. Conversely, the deterioration of the terms of trade will have the opposite effects on the pattern of government spending, which may delay growth prospects in SSA countries. Secondly, when economic agents perfectly observe the state of the economy, they tend to demand higher utility for themselves during episodes of capital inflows triggered by improvements in commodity terms of trade. This forces the government to impart a substantial increase in public spending during the terms of trade booms. Given the temporary nature of the increase in the terms of trade and the lack of access to international capital markets, one may assist to a contractionary government spending in bad times, which may hamper growth, and have long-term welfare implications. The findings from this study provide support in favor of the aforementioned mechanisms driving the procyclical behavior of government spending with respect to terms of trade movements in SSA countries. This is in accordance with several previous studies (Frankel et al., 2013; Kaminsky, 2010; Mpatswe, J-A Tapsoba, York, & by Gaston Mpatswe, 2011).

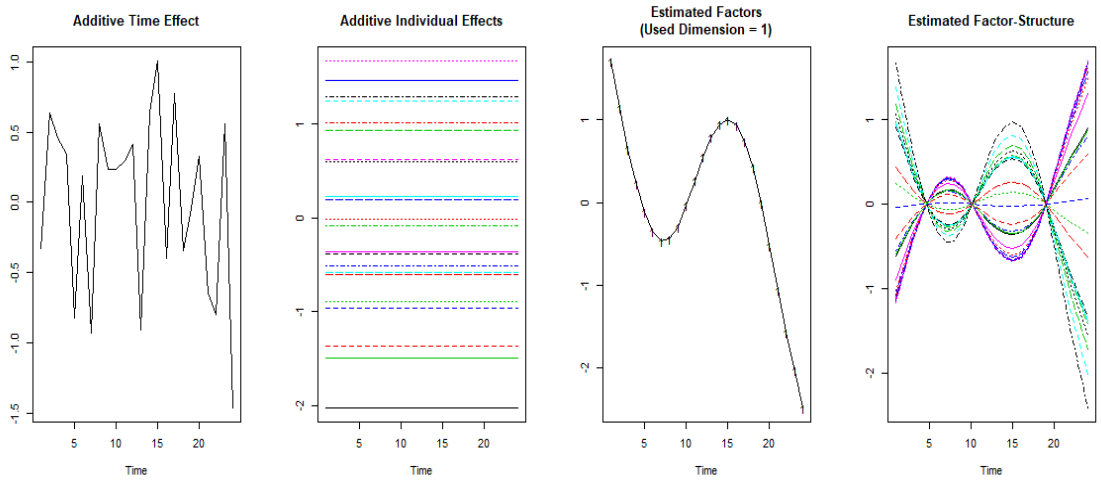

Figure 12. Decomposition of the additive effects and factor structure of the interactive effects.

Figure 12 illustrates the additive time and individual effects, the estimated common factors, and the time-varying individual effects. The left panel shows the additive time effects with a higher volatile tendency over the sample period. The estimated common factor is time-varying and follows an inverted N-shape. The right panel illustrates shows the estimated time-varying individual effects. One observation is that the densely compounding time-varying individual effects have been converging and diverging over time. The convergence path of fiscal policy signifies for the instantaneous transmission mechanism from external shocks mediated through the terms of trade, and the afterward divergence highlights the fact that shocks to any part of fiscal policy are counterbalanced with the adoption of optimal fiscal policies corresponding to the state of the fiscal policy before the occurrence of the terms of trade shocks. The additive individual effects are long-lasting for decades, suggesting that SSA countries are not converging to sustainable fiscal policy. This highlights the possible heterogeneity in the adoption of fiscal policies across SSA countries. These insights show that the IFE framework captures effectively the unobserved patterns in fiscal policy across SSA countries.

Table 13 also displays the cyclical patterns of government revenue with respect to commodity terms of trade across different flittering techniques. We find that the coefficient of commodity terms of trade is marginal (close to zero) and insignificant except for the case where the BP filter is used to measure the cyclical patterns of government revenue. This is indicative that the behavior of government tax revenue tends to be acyclical in response to the terms of trade cycles. The acyclical pattern of government revenue implies that the terms of trade cycles will neither reinforce nor stabilize government revenue. Thus, the cyclical pattern of government revenue is less responsive to terms of trade movements in comparison with the cyclical component of government spending. This finding provides evidence that distinguishing between both sides (spending and revenue) of fiscal policy needs to be considered to further elucidate the cyclical behavior of fiscal stances in SSA countries. The inertia effect captured by the lagged of fiscal variables is positive and statistically significant. From the spending and revenue sides of the budget, this suggests that the cyclicality of fiscal policy is unsustainable in the long run.

Figure 12 shows the decomposition of the additive effects into individual and time effects with the time-varying individual effects and the reducing factor dimension, which is

considered as the transition process from the estimators without additive effects (none) to the estimators with both time and individual effects (two-way).

6.3.4.2. The sensitivity of Fiscal Policy Pro-cyclicality to Openness

Many previous studies discuss the association between financial and trade openness and the cyclicality of fiscal policies. In this section, we address the question of how to trade and financial openness may reduce the degree of procyclicality of fiscal policy in SSA countries. Theoretically, the Keynesian model holds that greater openness to international trade tends to reduce the effectiveness of the fiscal policy, which makes fiscal policy more effective in closed economies than they are in open economies. The key mechanism is that a more open economy is more exposed to external shocks and terms of trade uncertainties causing large fluctuations in the tax revenue from primary commodity, as, in the case of SSA countries, a volatile tax base will lead to a volatile government spending.

In view of this mechanism, one may argue that SSA countries characterized by greater trade openness tend to experience a more pro-cyclical fiscal policy compared with countries with lower levels of trade openness. This is mainly due to the fact that trade openness may reinforce the effects of the terms of trade on fiscal variables during boom episodes while the opposite effect is likely to occur during bad times (terms of trade deterioration).

Regarding financial openness, we examine whether greater access to external sources of finance can mitigate the procyclical pattern of fiscal policy during episodes of the terms of trade deterioration and lead to fiscal discipline (Table 14). Evidence suggests that the lack of access to alternative sources of deficit financing increases pressures on fiscal stances during episodes of adverse terms of trade shocks. In this respect, financial openness can be a channel to reverse the procyclicality of fiscal stances over the terms of trade cycles. The hypothesis to be tested is that more financially opened are likely to experience less pro-cyclical fiscal policy than countries without access to external financial instruments.

Table 14. Sensitivity of fiscal procyclicality to trade and financial openness

	Cyclical degree of government expenditure				Cyclical degree of government revenue			
	HP filter	HP filter	BP filter	BP filter	HP filter	HP filter	BP filter	BP filter
L.gex	0.603[a]	0.596[a]	0.800[a]	0.612[a]				
	(0.000)	(0.000)	(0.000)	(0.000)				
L.grev					0.306[a]	0.596[a]	0.800[a]	0.744[a]
					(0.000)	(0.000)	(0.000)	(0.000)
TOT	0.028[c]	0.035[c]	0.129[a]	0.001[c]	0.042	0.002[b]	0.001[b]	0.035[b]
	(0.099)	(0.087)	(0.000)	(0.063)	(0.176)	(0.010)	(0.019)	(0.045)
$TOT \times FIN$	-0.015[c]		-0.123[a]		-0.361		-0.019[b]	
	(0.063)		(0.002)		(0.033)		(0.047)	
$TOT \times OPEN$		0.007[c]		0.001[b]		0.017		0.003[b]
		(0.063)		(0.056)		(0.184)		(0.017)
Intercept	-0.071	-0.056	0.009	0.020	-0.071[b]	0.056	0.009[b]	0.340
	(0.127)	(0.115)	(0.126)	(0.140)	(0.027)	(0.115)	(0.026)	(0.126)
Add. Eff.	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways
Factor Dim.	1	1	1	1	1	1	1	1
R squared	0.786	0.954	0.978	0.966	0.856	0.549	0.954	0.980

Notes: The p-values are presented under the parentheses. [a], [b] and [c] depict the statistical significance levels at 1%, 5% and 10%, respectively.

Table 14 presents the results of the direct effect of terms of trade on fiscal variables as well as the indirect effects through financial and trade openness. In doing so, we examine whether openness mitigates or amplify the degree of procyclicality of fiscal policy in SSA countries.

In line with our hypothesis, the IFE results yield a positive and significant effect for terms of trade on government spending across all specifications suggesting the procyclicality of government spending with respect to the terms of trade, and a negative and significant estimate for the interaction between terms of trade and financial openness. This implies that government spending is countercyclical in SSA countries that exhibit greater financial openness, while it is pro-cyclical in countries with lower levels of financial openness. A higher financial openness influences the government's ability to borrow, especially during economic downturns, which in turn decreases the degree of procyclicality in government spending. This finding is in line with several previous studies (Caballero & Krishnamurthy, 2004; Gavin & Perotti, 1997; Vegh & Riascos, 2003).

Turning to government revenue, one observation is that the coefficients of the interaction terms between financial openness and the terms of trade are no longer statistically significant. This outcome can be partly explained by the fiscal challenges brought by

financial openness including tax evasion and fiscal corruption of multinational companies despite the low level of financial integration of SSA countries (Beck, Lin, & Ma, 2014).

Now we focus our discussion on the estimation results based on the interaction between the terms of trade and the level of trade openness. One observation is that the coefficient of the terms of trade cyclicality times trade openness is positive and close to zero for the underlying fiscal variables (revenue and spending). More importantly, we found that the coefficient is not significantly robust across various filtering techniques. This finding makes us confident that trade openness tends to fiscal policy acyclical with respect to the terms of trade cycle. Contrary to financial openness, we demonstrated that trade liberalization does not seem to have a strong impact on the cyclicality of fiscal policy with respect to the terms of trade. This corroborates the results from (Karimi, Kaliappan, Ismail, & Hamzah, 2016), who found that trade openness does not have a significant impact on tax structure in developing countries.

6.3.4.3. The sensitivity of Fiscal Policy Procyclicality to The Exchange Rate Regimes

In this section, we examine whether the exchange rate regime matters for efficient fiscal policy in SSA countries. In this light, interaction terms are included between terms of trade and dummies for exchange rate regimes. The conventional wisdom suggests that fixed exchange rates provide more fiscal discipline than flexible exchange rates (Frenkel & Goldstein, 1989; Kaminsky, 2010; Montiel, Aghevli, & Khan, 1991; Tornell & Velasco, 1995, 2000). The claim is that fixed exchange rate regimes limit central banks' ability to adopt lax fiscal policies which may lead to important foreign reserve loss and thus to a breakdown of the peg. As reported by Canavan and Tommasi (1997), a commitment to a fixed exchange rate reduces the credibility and inflation problems face by policymakers as the public can quickly and easily monitor and detect any bad behavior of policymakers. Following this argument, countries with fixed regimes are more disciplinary than those with flexible rates. Another theoretical framework posits that flexible regimes have a greater ability to absorb real external shocks in a small open economy (Friedman, 1953; Hoffmann, 2007; Mundell, 1961; Obstfeld & Rogoff, 2000). In this study, we hypothesize that a flexible exchange rate can decrease the degree of fiscal procyclical in response to real shocks induced by terms of trade movements more

effectively than fixed exchange rate regimes. In this study, we consider the possible heterogeneity in the degree of fiscal procyclicality across countries by splitting our sample into two subpanels: CFA franc countries and non-CFA franc countries. As highlighted before, the CFA countries maintain a fixed exchange rate regime whereas the non-CFA franc countries generally do not. we use a dummy variable that takes the value 1 for CFA franc countries and 0 otherwise for *ERR1*, while *ERR2* takes the value 1 for non-CFA countries and zero otherwise.

Table 15. Sensitivity of fiscal procyclicality to exchange rate regimes

	Cyclical degree of government expenditure				Cyclical degree of government revenue			
	HP filter	HP filter	BP filter	BP filter	HP filter	HP filter	BP filter	BP filter
L.gex	0.604[a]	0.615[a]	0.709[a]	0.710[a]				
	(0.000)	(0.001)	(0.000)	(0.000)				
L.grev					0.444[a]	0.320[a]	0.837[a]	0.843[a]
					(0.000)	(0.000)	(0.000)	(0.000)
TOT	0.030	0.016[a]	0.053[b]	0.040[a]	0.009	0.009[b]	0.024[a]	0.076[b]
	(0.148)	(0.004)	(0.043)	(0.000)	(0.176)	(0.014)	(0.002)	(0.044)
$TOT \times ERR1$	-0.048		-0.131[a]		-0.128[c]		-0.045[a]	
	(0.601)		(0.002)		(0.051)		(0.006)	
$TOT \times ERR2$		-0.014[c]		-0.052[a]		-0.004[b]		-0.007[c]
		(0.067)		(0.005)		(0.026)		(0.090)
Intercept	0.178	0.073	0.617[c]	0.543	0.241	0.556	0.393	0.717
	(0.540)	(0.149)	(0.095)	(0.181)	(0.633)	(0.043)	(0.505)	(0.249)
Add. Eff.	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways
Factor Dim.	2	1	1	1	1	1	1	1
R squared	0.437	0.492	0.972	0.967	0.581	0.449	0.954	0.954

Notes: The p-values are presented under the parentheses. [a], [b] and [c] depict the statistical significance levels at 1%, 5%, and 10%, respectively.

Evidence from Table 15 can be summarized as below:

(i) In line with our baseline results, we observe a procyclical pattern of fiscal policy with respect to the terms of trade cycle although the degree of fiscal procyclicality seems to tend to be statistically insignificant when considering the cycle component of government revenue as a measure of fiscal policy cyclicality. As discussed in previous sections, the higher degree of government spending procyclicality in response to the terms of trade cycles is consistent with the predictions of the voracity effect of government spending during episodes of economic upturns.

(ii) Considering the possible impact of different exchange rate regimes on the pro-cyclicality of fiscal policy, we interact the terms of trade cycle with dummies for fixed

and flexible exchange rate regimes in SSA. We find that the cyclicality pattern of fiscal policy does not differ systematically across regimes, as the interaction terms are negative across all specifications.

(iii) The interaction terms for fixed exchange rate regimes are significantly negative and close to zero suggesting the marginal role of fixed regimes in smoothing fiscal variables out the terms of trade cycles.[19] This is interpreted as evidence that fixed exchange rate regimes are not able to effectively cope with the terms of the trade cycle. However, the coefficients of the interaction terms tend to be significant when considering the cyclicality behavior of government spending consistent with the evidence that the terms of trade cycles are the underlying cause of the pro-cyclical bias in government spending in SSA countries.

(iv) As expected, the interaction terms between the flexible exchange rate regime variables and the terms of trade cycle are negative and highly significant, meaning that flexible exchange rate regimes allow SSA countries to avoid the pro-cyclical bias of fiscal policy with respect to the terms of trade cycles. This finding confirms the theoretical idea that flexible exchange rate regimes act as shock absorbers in small open economies subject to real shocks such as the terms of trade shocks (Chia & Alba, 2006; Edwards & Levy Yeyati, 2005). This suggests that flexible exchange regimes tend to reverse the pro-cyclicality bias and contribute to a more counter-cyclical fiscal policy with respect to the terms of trade cycle.

6.3.4.4. The sensitivity of Fiscal Policy Pro-Cyclicality to the Heterogeneity Across Commodity Exporters

In order to account for possible differences in the degree of pro-cyclicality among SSA commodity-exporting countries, we split our sample into two subsamples including countries specialized in the export of energy and mineral commodities and the second subsample encompasses countries specialized in the export of soft commodities such as food, beverages, and other agricultural commodities. This analysis is dictated in particular by the evidence that energy and mineral commodity exporters are subject to

[19] To safely comment the differences across regimes, the authors constitute two dummies for fixed and flexible regimes and consider their interactions with the terms of trade cycles.

highly volatile terms of trade shocks and uncertain government revenues, which make fiscal management highly challenging in these countries (El Anshasy & Bradley, 2012; Gelb, Eifert, & Tallroth, 2002; Sturm, Gurtner, & González Alegre, 2009).[20] In addition, extractive resources such as oil and mineral are more likely to cause severe conflict, political distortions, and rent-seeking compared with diffuse/soft resources (Koh, 2017; Mehlum et al., 2006; Ross, 2001). In view of this discussion, one may argue that oil-exporting countries are likely to exhibit suboptimal fiscal policy in comparison with countries exporting other types of commodities. Empirically, we test this hypothesis by estimating the degree of fiscal procyclicality across commodity-exporting countries by introducing the interaction terms between the terms of trade cycles and dummies for extractive commodity-exporting countries and soft commodity-exporting countries, respectively, as independent variables.

Table 16. The sensitivity of fiscal policy procyclicality to commodity types.

	Cyclical degree of government expenditure				Cyclical degree of government revenue			
	HP filter	HP filter	BP filter	BP filter	HP filter	HP filter	BP filter	BP filter
L.gex	0.045	0.635[a]	0.840[a]	0.651[a]				
	(0.105)	(0.000)	(0.000)	(0.000)				
L.grev					0.063[a]	0.821[a]	0.483[a]	0.723[a]
					(0.000)	(0.000)	(0.000)	(0.000)
TOT	0.079[c]	0.013[c]	0.016[b]	0.012	0.041[c]	0.156[a]	0.012[a]	0.160[b]
	(0.065)	(0.058)	(0.050)	(0.155)	(0.086)	(0.000)	(0.001)	(0.031)
$TOT \times Panel1$	0.011[c]		0.033[b]		0.961[b]		0.077[a]	
	(0.063)		(0.012)		(0.029)		(0.000)	
$TOT \times Panel2$		0.002		0.006[c]		0.011[b]		0.001
		(0.172)		(0.090)		(0.022)		(0.171)
Intercept	-0.371	0.054	0.211	0.842[c]	0.001[a]	0.156[a]	0.361[c]	0.774
	(0.456)	(0.148)	(0.132)	(0.069)	(0.000)	(0.008)	(0.093)	(0.198)
Add. Eff.	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways	Two-ways
Factor Dim.	1	1	1	1	1	1	1	1
R squared	0.628	0.588	0.936	0.940	0.866	0.585	0.932	0.978

Notes: The p-values are presented under the parentheses. [a], [b] and [c] depict the statistical significance levels at 1%, 5%, and 10%, respectively.

The results from Table (16) indicate a strong degree of heterogeneity across commodity-exporting countries in SSA. Indeed, the findings confirm our previous hypothesis that extractive (oil and mineral commodities) commodity-exporting countries suffer from the

[20] Energy prices are at least twice as volatile as other agricultural products.

predominance of a pro-cyclical fiscal policy bias as the interaction term for oil and mineral exporters is significantly positive and close to 1 when considering the revenue side of the fiscal stance. This provides evidence in favor of the relatively weak non-oil/mineral tax base reinforcing the procyclicality bias stemming from government tax revenue with respect to the terms of trade cycle (El Anshasy & Bradley, 2012). Overall, our estimation outcomes suggest that fiscal policy has been expansionary and procyclical in mineral and oil-exporting countries thanks to rising oil and mineral prices. This finding provides new support for the fiscal argument of the resource curse hypothesis as suboptimal and inappropriate fiscal policy frameworks pose challenges in the long term with regard to fiscal sustainability.

In comparing the degree of fiscal pro-cyclicality across commodity-exporting subgroups, one observes that the procyclicality bias is relatively strong among extractive exporters compared to non-extractive countries. This suggests that commodity-exporting countries whose fiscal policy is suboptimal are those specialized in the export of energy and mineral products. One reason behind this is that oil and mineral revenues are exhaustible, volatile, uncertain and the larger share of the oil sector in the overall economy.

CHAPTER 7

CONCLUSION

7.1. General Conclusion

In commodity-based economies, such as those dependent on primary commodities, external shocks mediated through the terms of trade and commodity price shocks pose specific macroeconomic challenges, which mainly stem from poor financial performance, corruption, lower levels of governance, and accountability, weak institutions, and suboptimal fiscal policies. These specific challenges lead to unsatisfactory development outcomes and high macroeconomic instability in commodity-based economies. This phenomenon has been referred to as the resource curse paradox (Auty, 2001; Sachs & Warner, 1995).

Achieving a better policy prescription to mitigate the transmission of external shocks and reverse the resource curse paradox remains one of the key policy challenges in commodity-dependent countries. This thesis undertakes this task by quantifying the importance of the terms of trade and primary commodity price as triggers of macroeconomic indicators such as the level of financial development, the dynamics of the real exchange rate, and the cyclical behavior of fiscal policy in African countries. We exclusively focused on the case of sub-Saharan African countries mainly because African countries are highly dependent on the volatile prices of primary commodities and movements in their terms of trade account for a large fraction of fluctuations in key macroeconomic indicators (Bleaney & Greenaway, 2001; Cashin, McDermott, & Pattillo, 2004; Collier & Gunning, 1999; Deaton & Miller, 1995).

Therefore, the objective of this thesis was to analyze the effects of terms of trade and primary commodity price shocks on macroeconomic variables such as financial development, real exchange rate, and fiscal outcomes and to do so, we have combined

advanced time series and panel data estimation strategies in order to yield more reliable outcomes. The estimation strategies allow us to deal with several caveats in the existing literature by accounting for nonlinearity, threshold effect, endogeneity, cross-sectional dependence, cross-country heterogeneity, individual effects, time effects, and factor structure in the panel data analysis.

Firstly, we account for nonlinearity and threshold effect of democratic accountability by using the PSTR estimation strategy developed by González et al. (2017). Through this approach, the estimated threshold level of democratic accountability is estimated as well as the regime-dependent effects of oil prices on financial development. In addition, the endogeneity issue is addressed by using the dynamic panel threshold model proposed by (Kremer et al., 2013). By using these two approaches, this study provides more reliable outcomes regarding the financial resource curse paradox.

Secondly, we investigated the responses of the RER to commodity terms of trade and primary commodity price shocks for a sample of twenty-three African countries from 2003:01 to 2017:12. The empirical approach adopted in this paper lies in three steps. (i), we conducted a battery of panel unit root tests that account for cross-section dependence and structural breaks in the series. (ii), we employed both the newly advanced asymmetric panel cointegration tests by Hatemi-J (2018) to detect the eventual hidden cointegration relationship between the dynamics of the real effective exchange rate, commodity terms of trade, and real primary commodity prices. (iii) We used both the pooled mean group and the mean group techniques to estimate the nonlinear panel ARDL model following Pesaran and Shin (2012).

We argued that the mixed evidence in previous studies is at least partly due to the use of commodity terms of trade indices restricted to a small fraction of commodities and based on fixed weights of the price of these commodities. As discussed in Gruss and Kebhaj (2019), such indices of commodity terms of trade may provide an inaccurate picture of the relevance of commodity price shocks in empirical analyses spanning over several decades. Essentially, Gruss and Kebhaj (2019) provide a comprehensive measure of commodity terms of trade indices based on time-varying weights for a broader sample of countries and covering a longer time span. In order to increase the relevance of this thesis, we extended our model by taking separately into account the ways that real effective

exchange rates respond to major primary commodities namely agricultural and raw materials, energy, metal and, food and beverages over both the long- and the short-run.

Thirdly, we employed the interactive fixed effects developed by (Kneip et al., 2012) to study the degree of fiscal policy procyclicality with respect to the terms of trade cycle. The IFE method provides a complete picture of the cyclicality behavior of fiscal policy with respect to the terms of the trade cycle by using sufficient information from the neglected time trends from the constant term within the standard assumptions. Effectively, the interactive fixed effects techniques model the time trends which drive the temporal unobserved heterogeneity without any restrictions on the temporal pattern of individual effects in the IFE and additional additive effect, while the conventional panel data models impose some restrictions on the error term. From an econometric point of view, the IFE models enable us to account for both the additive individual effects (government spending and government tax revenue) and the time-varying interactive effects (upward/downward terms of trade trends).

7.2. Main Results

Considering that this study posits that the level of democratic accountability plays a key role in shaping the financial resource curse in oil-exporting countries, it is important to explore this hypothesis by using advanced panel data techniques. In doing so, this study was able to find a threshold effect of democratic accountability on the relationship between oil prices and financial development in oil-exporting countries. Conditioned by the level of democratic accountability, oil prices exert both a negative and positive effect on financial development outcomes. Beyond a critical level of democratic accountability, there is a positive correlation between oil price swings and financial development. These findings remain intact for various indicators of financial development. Besides, the inclusion of major triggers of financial development discussed in the literature do not alter the empirical findings, confirming the robustness of the estimation results. Improvements in democratic accountability are fundamental in understanding differences in the level of financial development. Thus, democratic accountability deserves further attention in the emerging literature regarding the financial resource curse. In addition, we estimate the critical level of democratic accountability able to reverse the financial resource curse. Based on these outcomes, policymakers should improve democratic institutions in oil-

exporting countries in order to immunize the financial sector to external shocks stemming from world oil markets.

Concerning the response of the real exchange rate to commodity terms of trade and primary commodity price shocks, we showed that shocks are relatively transitory, and these commodities fluctuate around their equilibrium as suggested by the Prebish-Singer hypothesis. On the other hand, real energy and real metal commodity prices are integrated of order one providing evidence against the prediction of the Prebish-Singer hypothesis. As discussed above, we report an important degree of coincidence in the stochastic behavior of metal and energy prices. Our empirical results provide strong evidence for the stationarity of real effective exchange rates, supporting the purchasing power parity hypothesis. These results are valid for the whole sample and for the four primary commodity subsamples. We observed strong empirical evidence in favor of the asymmetric cointegration relationship between RER and commodity prices as the linear panel cointegration fail to find any cointegration relationship between the series. This is indicative of the fact that commodity and currency markets are asymmetrically cointegrated, suggesting that the RER of primary commodity-exporting countries in Africa are nonlinearly/asymmetrically integrated with world commodity markets. This finding has important implications for hedging strategies and exchange rate policies. We show that real effective exchange rates respond asymmetrically to the variants of terms of trade shocks.

More importantly, we find evidence for the real appreciation of the exchange rate in response to terms of trade shocks in the long run while in the short run, negative shocks in the terms of trade caused the RER to depreciate. The real depreciation in response to negative terms of trade shocks may bring some benefits to the economy: (i) it may boost goods exports and restores the market clearing mechanism; (ii) preserves foreign reserve as a buffer against future commodity price volatility in the long run. Our findings suggest some heterogeneity in the response of the real effective exchange rate to individual primary commodity price shocks across commodity-exporting subgroups. Effectively, we find that the responses of RER differ across commodity subgroups indicating that the commodity currency hypothesis is not homogeneous across primary commodities. We reveal that energy and metal commodity-exporting subgroups are the most subject to real appreciation in the long run in comparison to countries exporting soft commodities such

as agricultural and food and beverage commodities. This indicates that energy and metal commodity-exporting countries are likely to experience a real appreciation of their currencies and suffer from severe Dutch disease. Hence, there is a need to remediate to the loss of the external competitiveness associated with real appreciation by coordinating monetary and fiscal policies to effectively absorb the huge additional foreign reserves and ensure exchange rate equilibrium level, which will bring macroeconomic stability in these countries.

Evidence suggests that foreign investment inflows have a less harmful effect on the dynamics of RER across commodity-exporting countries in Africa. However, the recent wave of FDI towards developing countries has amplified the impacts from the terms of trade and commodity price shocks on the dynamics of real exchange rates across African countries.

Turning now to the cyclical behavior of fiscal policy with respect to the terms of trade cycle, results from two complementary filtering approaches suggest that the terms of trade cycle result in procyclical government spending and government revenue, although we observe a lower degree of procyclicality for government revenue. The strong procyclical pattern of government spending emerges because SSA countries tend to perceive terms of trade improvements as permanent and increase spending accordingly. This is worrying, given the tendency of governments to boosts unproductive and poor-quality spending programs during boom episodes, which may lead to excessive accumulation of government debt, high and unsustainable fiscal deficits due to the financial capacity constraints during episodes of terms of trade deterioration. We also examined what explains the degree of fiscal policy procyclicality among SSA countries. We demonstrated that outward financial oriented countries were better able to overcome the fiscal procyclicality bias stemming from the terms of trade cycles.

Conversely, greater reliance on international trade characterized by a higher degree of trade openness amplifies the degree of pro-cyclicality of fiscal policy in SSA countries. The analysis showed that reliance on trade openness to dampen the procyclicality of fiscal policy associated with terms of trade shocks is not significantly efficient in the context of SSA countries. Considering the possible impact of different exchange rate regimes on the procyclicality of fiscal policy, one observation is that flexible exchange regimes tend to

reverse the procyclicality bias and contribute to a more countercyclical fiscal policy with respect to the terms of trade cycle, although fixed exchange rate regimes tend to be ineffective in addressing the procyclical fiscal policy bias in SSA countries. To address the cross-country heterogeneity across SSA countries, we explore the degree of fiscal procyclicality by comparing the cyclical behavior of fiscal policy in extractive commodity-exporting countries with non-extractive commodity-exporting countries. one observation is that the pro-cyclicality bias is relatively strong among extractive exporters compared to non-extractive countries. We emphasized that commodity-exporting countries whose fiscal policy is suboptimal those specialized in the export of energy and mineral products. One reason behind is this is that oil and mineral revenues are exhaustible, volatile, uncertain and the larger share of the oil sector in the overall economy.

7.3. Policy implications

Starting with the investigation of the financial resource curse paradox, it is important for policymakers to establish a new institutional framework with a strong system of accountability and political checks including modern accounting standards, greater transparency to protect investors, and competition in the financial sector. These institutional reforms are critical to manage effectively external shocks stemming from oil price fluctuations and deal with the higher vulnerability of these countries to oil shocks. By improving their democratic institutions, policymakers would indirectly deal with several odd features of oil such as the dominant public sector, rent-seeking activities, and corruption. Such a structural and institutional transformation of their economies would reduce the likelihood of oil exporters to restrict their production in order to take advantage of higher oil prices, which in turn may put less pressure on the supply-side in oil markets and accelerate the global energy security. By fostering the resilience of the financial system through institutional reforms, oil exporters would not only diversify their economies but also generates positive externalities for oil importers and implicitly address the issue of energy security.

Regarding the currency-commodity nexus, an important implication based on the findings is that policymakers in extractive commodity-exporting countries, should be careful not to put too much weight on the benefits of capital inflows triggered by higher energy and

metal prices, rather, policy responses should aim at adequately managing real appreciation risks associated with metal and energy price changes. Turning to the non-extractive commodity-exporting countries, the optimal response would depend, to some extent, on the type of shock over different time horizons. For instance, policymakers in food and beverage commodity-exporting countries should place more weight on the use of macroprudential policies to stabilize the exchange rate in the short-run comparatively to the long-run. However, in the case of agricultural commodity-exporting countries, the policy would need to focus on mitigating overheating in the long-run by adopting a contractionary fiscal policy to contain real appreciation. The optimal policy response with respect to the terms of trade and primary commodity price shocks would consist of taking advantage of the capital inflows due to terms of trade improvements/higher primary commodity prices while dealing at the same time with the adverse consequences it may cause on the stability of the real exchange rates. In addition, African countries should adopt effective FDI policies that ensure the absorption of foreign capital inflows and minimize their impact on real exchange rate volatilities.

How might the cyclicality pattern of fiscal policy with respect to the terms of trade cycle be useful for policymakers in Africa? The extent to which a country fundamentally adjusts its fiscal policy to a shock versus attempts to smooth out the adverse effects of the terms of trade shocks should dependent on shocks' importance as sources of fiscal policy procyclicality. Policymakers should address the pro-cyclical pattern of fiscal policy by adopting strategies to mitigate the severe impact of terms of trade on fiscal policy sustainability. This can be achieved by economic reforms that enhance economic diversification, which may change SSA oil exporters' long-standing economic models. An efficient framework for economic diversification requires engaging the private sector and improving the institutional environment for diversification purposes. To limit the scope for pro-cyclical fiscal response in reaction to terms of trade cycles, policymakers need to open up their financial market to international competition in order to improve the depth of the financial sector, which may improve their access to financial services during episodes of economic contraction. Also, our estimation results hold in favor of the flexible exchange rate regime, as it provides counter-cyclical fiscal policies. Based on this finding, one may argue that the usefulness of the CFA zone may be limited to achieve a sustainable fiscal policy. Another important implication of our results is that

government spending tends to be more sensitive to terms of trade cycles compared to government revenue. This highlights the necessity to put in place strong macroprudential policies to strengthen the resilience of government spending to terms of trade cycles.

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APPENDICES

Appendix A

Table A-1 Summary statistics cyclical components of fiscal policies and the terms of trade

Descriptive Statistics					
HP-Filter	Mean	Std. Dev.	Skewness	Kurtosis	Corr.
TOT	-2.16E-14	0.521	-2.217	6.127	
GRV	-2.30E-14	0.833	-0.177	2.311	0.059
GEX	-2.55E-14	0.845	-0.493	2.392	0.185[a]
BP-Filter					
TOT	0.106	0.596	1.462	5.692	
GRV	0.083	0.843	0.144	4.346	0.366[b]
GEX	0.089	0.870	-0.130	3.595	0.422[a]

Note: [a] denotes significance level at 1%.

Table A-2 Literature Review

Author (s)	Country	Data	Variables used	Method(s)	Main Finding (s)
(Beck, 2012)	Resource-based economies	2000-2007	Financial development indicators, natural resource exports (%GDP), real GDP, inflation, and institutional variables	Panel fixed effects	Natural resource curse in financial development with long-term negative repercussions for economic growth
(Bhattacharyya & Hodler, 2014)	133 countries	1970-2005	Financial development indicators, natural resource rents, Polity 2, per capita income	Panel fixed effects	Resource rents negatively affect financial development in countries with weak political institutions and this negative effect disappears as the quality of political institutions improves.
(Nwani et al., 2016)	Nigeria	1975-2011	Financial intermediary development, crude oil price, economic growth, inflation, and trade openness	Autoregressive distributed lad approach	Positive significant long-run effect of crude oil price on financial intermediary development in Nigeria
(Khandelwal et al., 2016)	GCC countries	1999-2014	Macroeconomic and financial sector variables	Panel GMM approach	Feedback effects between oil price movements, bank balance sheets and asset prices in the GCC.
Beck and Poelhekke (2017)	156 countries	1971-2008	Exogenous world price shocks, Financial development indicators, Macro indicators,	Dynamic panel regressions	Exogenous world price shocks negatively affect financial sector deposits and lending.
Dwumfour and Gyamfi (2018)	38 African countries	2000-2012	Financial development, resource rents, governance indicators, inflation, Education, and Inflation	Panel GMM	Ambiguous effect of natural resource rents on financial development. Positive impact of rents on credit in all regions.
Jarrett et al. (2019)	11 oil rich-countries and 44 countries.	1980-	Financial depth, GDP per capita, Oil price, macroeconomic indicators	Synthetic control methodology and CS-ARDL.	The negative effects of oil volatility on growth is mitigated with better financial institutions.

		2016.			
Mlachila and Ouedraogo (2019)	68 commodity rich developing countries	1980-2014	Financial sector development indicators, commodity price shocks, macroeconomic variables.	Panel GMM	Strong evidence of financial resource curse. The financial resource curse can be mitigated through good quality of governance.
(M. A. Khan et al., 2019)	United States	1984-2016	Financial development, institutional quality, economic policy uncertainty, capital, trade openness, natural resource rents	Autoregressive distributed lad model and Granger causality technique	Negative effect of natural resource rents on financial development. Institutional quality moderates the effect of natural resource rents on financial development.
(Zakharov, 2020)	77 Russian regions	2003-2013	Oil price, tax revenue, institutional quality, GDP	Two-stage Least Squares	Subnational resource curse
(Atil et al., 2020)	Pakistan	1972-2017	Natural resources, financial development, oil prices and economic growth	Long-run co-variability approach	Oil prices and natural resources have positive effect on financial development

Appendix B

Table B-1 Descriptive statistics

Variable	DCPS	PCDM	DEPO	Oil price	DEMO	GDP	OPEN	FINGLOB	GVT	INF
Mean	50.364	41.323	42.13	45.138	3.528	17305.77	72.396	70.205	15.695	31.855
Median	34	24.812	32.516	30.37	3.25	8641.275	64.476	64.609	14.716	13.5
Maximum	206.67	195.655	137.417	100.06	6	91565.73	210.161	210.161	35.222	150.483
Minimum	6.338	1.054	2.819	14.39	0	707.752	11.087	11.087	4.579	-11.686
Std. Dev.	42.695	42.701	31.532	29.518	1.688	20997.86	38.848	33.627	5.838	36.523
Skewness	1.54	1.672	0.043	0.721	0.043	1.701	1.108	1.32	0.559	1.024
Kurtosis	5.013	5.263	3.581	1.971	2.031	5.415	4.081	5.403	2.962	2.728
Jarque-Bera	313.279	377.299	106.94	50.249	21.884	402.66	97.348	294.884	28.993	98.774
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	555	555	555	555	555	555	555	555	555	555

Notes: The Table 2 has been constructed by employing the relevant numerical values. DCPS, PCDM and DEPO refer to domestic credit to private sector, Private credit by deposits money banks and Bank Deposits, respectively. Demo indicates democratic accountability, real GDP refers to real GDP per capita, Fin.Glob. indicates financial globalization index. GVT denotes government spending. INF represents inflation. Open stands for trade openness.

Table B-2: Descriptive statistics of terms of trade, real commodity price indices and real effective exchange rate

Variable	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Mean Equality test (χ^2)
Whole sample							
RER	4.593195	5.466667	3.997283	0.150107	0.434495	8.418429	25.236[a]
Terms of trade	4.586869	4.817223	4.029547	0.2435	-2.47303	11.64049	24.125[a]
Energy panel							
RER	4.65569	5.466667	4.029273	0.218075	0.748187	5.016206	7.554[a]
Energy price index	4.944789	5.578268	4.094861	0.384252	-0.36407	2.190473	17.356[a]
Agricultural and raw materials panel							
RER	4.582033	4.877485	4.024458	0.103126	-1.55722	7.980757	4.895[a]
Agriculture and raw material index	4.662683	5.232204	4.315686	0.18772	0.601327	3.505096	9.568[a]
Metals panel							
RER	4.533083	4.830551	3.997283	0.142763	-1.25874	4.416289	11.459[a]
Metal price index	4.801048	5.458257	3.77602	0.400032	-0.75659	2.904349	8.459[a]
Food and beverages panel							
RER	4.608672	4.921002	4.321214	0.103975	0.180182	4.26737	4.876[a]
Food price index	4.580867	4.898944	4.161972	0.193562	-0.3971	2.100841	5.45[a]

Notes: RER stands for real effective exchange rate; Obs. and Std. Dev. represent the numbers of observations and standard deviation, respectively; Variables are in logs and primary commodity prices are normalized by US CPI. Mean equality test (χ^2) distributed is employed to justify the subdivision across primary commodity price indices. [a] denotes 1% level of significance.

Table B-3 Estimated break periods from the Lee and Tieslau (2019) panel unit root test

Country	RER	Terms of Trade	Agricultural and raw material price index	Energy price index	Food and Beverages price index	Metals price index
Algeria	2008:11; 2009:03	2005:10; 2006:08		2005:03; 2006:05		
Angola	2010:02; 2010:06	2008:07; 2009:09		2005:05; 2008:04		
Burkina Faso	2005:05; 2008:06	2005:03; 2014:11	2008:07; 2010:06			
Burundi	2005:08; 2006:02	2005:03; 2014:11			2008:05; 2010:04	
Cameroon	2005:03; 2005:12	2005:04; 2005:08				
Cote d'Ivoire	2010:03; 2011:01	2007:04; 2008:03			2008:05; 2010:04	
Gabon	2005:03; 2015:09	2005:03; 2014:10		2005:03; 2006:05		
Ghana	2005:08; 2015:04	2009:03; 2009:09				2008:06; 2010:05
Kenya	2006:01; 2011:11	2005:03; 2014:11			2008:05; 2010:04	
Malawi	2009:04; 2012:09	2005:03; 2014:11	2008:07; 2010:06			
Mali	2005:12; 2015:04	2005:03; 2005:09	2008:07; 2010:06			
Mauritania	2015:07; 2008:04	2005:03; 2009:12				2008:06; 2010:05
Morocco	2005:03; 2009:07	2005:03; 2014:11	2008:07; 2010:06			
Mozambique	2005:03; 2006:06	2005:03; 2008:10	2008:07; 2010:06			
Niger	2005:04; 2005:12	2005:03; 2014:10				2008:06; 2010:05
Nigeria	2005:03; 2005:10	2005:03; 2005:08		2009:03; 2011:05		
Senegal	2005:07; 2005:12	2005:03; 2014:10	2008:07; 2010:06			
Sudan	2005:03; 2012:06	2005:03; 2008:09		2011:02; 2012:04		
South Africa	2011:01; 2011:11	2005:03; 2014:10				2008:06; 2010:05
Togo	2005:3; 2005:09	2005:03; 2014:09	2008:07; 2010:06			
Tunisia	2005:03; 2015:07	2005:03; 2015:06	2008:07; 2010:06			
Uganda	2015:03; 2015:08	2005:03; 2005:08			2008:05; 2010:04	
Zambia	2005:03; 2015:09	2005:03; 2008:06				2008:06; 2010:05

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