EFFECTS OF AGRICULTURAL, MANUFACTURING, AND MINERAL EXPORTS ON THE ECONOMIC GROWTH OF ANGOLA

By

TITUS ISAIAH ZAYONE

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Thesis Approved:

Dr. Shida Rastegari Henneberry

Thesis Adviser

Dr. Brian Adam

Dr. Marten Brienen

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Title of Study: EFFECTS OF AGRICULTURAL, MANUFACTURING, AND MINERAL EXPORTS ON THE ECONOMIC GROWTH OF ANGOLA

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Abstract: Angola's economic growth declined from 10.6% between 2003 and 2008 to 3.1% between 2009 and 2017 following plunges in petroleum prices (World Bank 2018). Mineral exports accounted for over 94% of Angola's total exports in 2017, and 99% of these were petroleum oil (UNCTAD 2016). The Angolan government aims at promoting economic diversification through private investment and exports promotion policies since 2003, to protect the economy from international market shock (Ministry of Economy and Planning 2018).

The objective of this research was to determine the effects of agricultural, manufacturing, and minerals exports on economic growth in Angola. Using exports and GDP time series data for Angola between 1980-2017, and an autoregressive distributed lag (ARDL) model, the study shows that mineral exports, manufacturing exports, and non-mineral exports (an aggregate of manufacturing and agricultural exports) positively influenced Angola's GDP growth in the long run. Mineral exports also positively affected GDP growth net of exports in the long run. In the short run, the lags of agricultural and mineral exports positively affected GDP growth, but the effects of manufacturing exports were negative. A vector error correction model (VECM) results also show evidence for export-led growth determined by mineral exports and non-mineral exports in the long run. However, GDP growth net of exports was negatively affected by manufacturing exports in the Long run.

Due to data limitations, results of the statistical analysis are not robust, but overall the results of this study are supportive of Angola's export promotion policies. Expanding the share of non-mineral exports in Angola would require improving the human capital and infrastructure, and strengthening the institutional capacity to ensure sustainable development.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The abundance of natural resources can be a blessing or a curse (Sahoo et al. 2014). The notion of resource curse continues to attract the attention of researchers to investigate the impacts of natural resource exports on economic growth. Low-income African countries tend to concentrate their exports in primary natural resources to foster economic growth. However, natural resources can be a curse when they are exploited to the detriment of the wellbeing of people, and a blessing otherwise (Sahoo et al. 2014).

The role of exports in economic growth has been studied, and empirical evidence suggests that export-led growth has been evident in the cases of the 'Asian Tigers' (which include Hong Kong, Singapore, South Korea, and Taiwan) (Tang et al. 2015). On the other hand, the experience of Sub-Saharan African countries is different because of the dependency on primary commodities export (Furuoka 2018). Exporting expands the market base for the exporting country, stimulate technological diffusion through competition on the international market, and lead to efficient utilization of productive resources by specializing in the production of export-oriented goods and services according to the country's comparative advantage, as well as providing foreign exchange required to import capital goods (Ribeiro et al. 2016). However, exporting primary commodities such as crude petroleum may have negative impacts on economic growth due to Dutch disease. Angola has opted for export promotion and import substitution policies meant to foster export-led growth and domestic industrial development.

Problem Statement

Angola's economy depends on mineral exports. Over 94% of exports in Angola are fuels and mining products. Since 1973 when petroleum oil become Angola's leading export commodity, the performance of non-petroleum sectors has been constrained Wolf (2017). As a result, Angola’s economic growth declined from 10.6% between 2003 and 2008 to 3.1% between 2009 and 2017 following plunges in petroleum prices (World Bank 2018). Diversifying the economy becomes inevitable for ensuring sustainable development. The economic diversification plan for Angola emphasizes expanding the share of agricultural and manufacturing exports, and reduce economic dependency on petroleum exports. This study attempts to answer the following question: What are the effects of agricultural, manufacturing, and mineral exports on economic growth in Angola?

Previous studies analyzed the impacts of exports on economic growth in panel studies and found no evidence for export-led growth in Angola (Tekin 2012; Karamelikli et al. 2017). However, Solarin et al. (2016) found a positive correlation between exports economic growth using time series analysis. Even so, no study has examined the effects of agricultural, manufacturing, and minerals exports on economic growth in Angola.

Research Objective

The objective of this study is to determine the effects of agricultural manufacturing, and minerals exports on economic growth in Angola. The growth effects of the exports by sector are necessary to provide support for the export promotion policies in Angola.

The export-led growth hypothesis is tested to explain the growth effects of increasing exports on economic growth in Angola. The agricultural, manufacturing and minerals exports time series between 1980 and 2017, and an autoregressive distributed lag (ARDL) model developed by Pesaran et al. (2001) are used to determine the long-run and short-run effects of the exports on GDP growth.

Angola Economic Performance

Angola is a southern African country neighboring Botswana, Democratic Republic of Congo, Namibia, and Zambia. The country has an estimate of a total population of 28 million people, 30% of which live below $1 per day (National Institute of Statistics, 2016). Angolas has a Human Development Index (HDI) of 0.581 relatively higher than the Sub-Saharan average of 0.537.

The econmy of Angola was led by the agricultural sector before the country became independence from Portuguese control in 1975. The country was a net exporter of agricultural commodities such as coffee, as the leading export commodity, until the early 1970s when petroleum become a leading export commodity. Post independence econmic reforms under a communist government (the Movement for the Liberation of Angola MPLA) embarked on nationalization of privately owned farms, which resulted in state failure and loss of agricultural competitiveness. Further devastation of the sector was caused by the revamp of civil war in 1976, which lasted until 2002.

In the 1880s, the government embarked on economic reforms to embrace the free market system. The transition was unsuccessful until the early 2000s. The need for reconstruction of the country led to a new development approach referred to as ‘Angola mode' trade. The model entails trading natural resource for local infrastructural development run by China and Brazil (Habiyaremye 2013). Diversification of the economy also became a necessary condition for economic growth in Angola after episodes of volatile petroleum prices (Ministry of Economy and Planning, 2018).

Growth in agricultural, manufacturing and sectors (see Figure 1) is driven by domestic demand, and by Government’s efforts to promote domestic food production to substitute for over 90% of food imports, and infrastructural development (Wolf 2017). The growth can also be attributed to foreign direct investments channeled to non-export sectors. Between 2003 and 2013, Angola attracted about US$12.3 billion, of which 81% was meant for the non-mineral sectors such as the construction and manufacturing sectors.

Angola’s export sector depends on petroleum. Agriculture and manufacturing exports are still low. Agricultural exports are dominated by coffee, fish, and woods while manufacturing exports dominated by the beverage industry. The main export markets for Angola include China, which accounted for about 50% of Angola’s export market, followed by the United States with 11%, then India, South Africa, Portugal and Spain (UNCTAD, 2016).

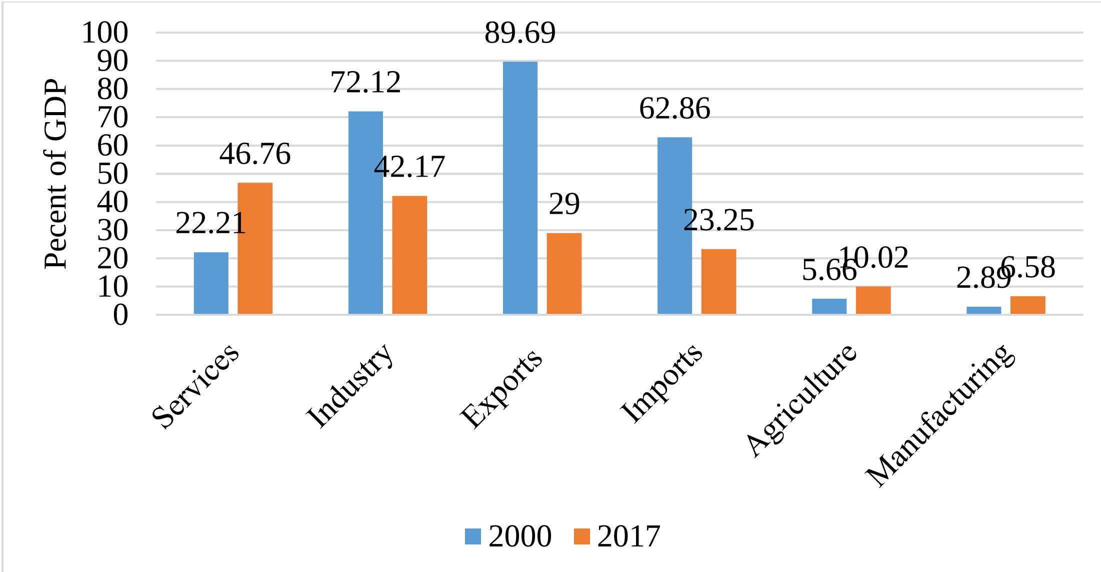

Figure 1. Angola's GDP composition by Sector (2000 and 2017)
Note: Industry include construction, Exports include goods and services, Imports include goods and services, and Agriculture includes forestry and fishing. Source: data obtained from the World Development Indicators database of the World Bank (2019). The percentages do not add up to 100 because of overlapping in the sectors.

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Theory suggest that the dominance of the natural resource sector tends crowd out the manufacturing and other non-resource sectors, and constrain economic growth (Bunte 2016). This study was expected to show that agricultural and manufacturing exports would lead to positive economic growth in Angola, while the effects of mineral exports on economic growth would be dependent on whether or not Dutch disease is present. The results of this study show that mineral exports, non-mineral exports, and manufacturing exports affected GDP positively. Thus, providing support for promoting Angola's non-petroleum exports. The rest of the paper is organized as follows. Chapter two is the review of the literature and provides a discussion of the export-led growth hypothesis in the context of a resource-rich developing country. The concept of Dutch disease gives light on the low incomes of developing countries despite the abundant natural resource. Chapter three outlines the methodology used in this study. The chapter covers the data and use of the ARDL model in this study. Chapter four presents and disuses the finding, and finally, chapter five concludes.

CHAPTER II

LITERATURE REVIEW

This chapter explains the effects of exports on economic growth. The chapter begins by highlighting the channels through which exports affect economic growth, and discussing factors affecting export led growth in resource-rich developing country. Next, the chapter discuss empirical findings on the export-led growth in Africa and in Angola.

The Export-Led Growth Hypothesis

The export-led growth (ELG) hypothesis describes the growth effects of increasing a country's exports on an economy. Exporting expands the market base, which in turn leads to increased production in the exporting economy; the exposure to competition in the global market stimulates technological diffusion and economies of scale in the exporting economy; exporting may lead to the specialization of production by reallocating productive resources from less productive sectors to more productive export sector according to a country's comparative advantage, and exports provide the foreign exchange required to finance imports, thus, reducing pressure on domestic savings and promote domestic investments (Ribeiro et al. 2016). However, the degree to which an economy depends on primary exports, the capacity of non-export sectors to absorb the knowledge spillovers from the export sector, and the degree of regulations governing labor and business operations determine the magnitude of growth effects (Dreger and Herzer 2013).

Dutch disease can inhibit export led growth in countries endowed with abundant natural resources (or resource-rich countries). There are two main channels through which a boom in natural resources can affect economic growth outlined by Bunte (2016). The first is the resource movement effect (RME), where labor and other productive resources move from non-natural resource sectors to petroleum and minerals, attracted by high marginal factor productivity and wages. Thus, the non-natural resource sector such as manufacturing tends to contract. The second is the spending effect (SP), which entails that natural resources rent tends to influence local spending and an appreciation of the exchange rate. As a result, the non-resource sectors tend to be crowded out. Thus, Allcott and Keniston (2018) consider that Dutch disease is due to inefficient markets and institutions, high levels of rent-seeking and corruption resulting from a boom in the natural resources (Deaton 1999; Collier 2006).

Bjørnland and Thorsrud (2016) made a contrary argument to the Dutch disease theory. According to Bjørnland and Thorsrud (2016), knowledge can flow between sectors, so that dominant natural resource sector may exert productivity effects on the non-natural resource sectors. This flow of knowledge may lead to increased productivity in non-natural resource sectors, therby leading to growth.

Exports and Economic Growth In Africa

The growth in the Asian 'Tigers' (Hong Kong, Singapore, South Korea, and Taiwan) in recent decades demonstrate the importance of export-led growth for developing countries (Tang et al. 2015). The success of Asian tigers can motivate African countries to adopt similar policies and foster export-led growth. However, African exports are concentrated in primary natural resources than manufactured goods, which are associated with deteriorating terms of trade. According to Deaton (1999), natural resource export can lead to growth if the resource rent is utilized to develop infrastructure and support investments, but Africa's development problem lies in poor investment appraisal. In addition, minerals are in most cases produced in "enclaves" using foreign capital or the state, and they are highly taxed, while small-holder farmers grow agricultural exports in African countries. The former leads to the concentration of wealth distribution power in the state, while the latter allows income to farmers Deaton (1999).

Collier, (2006) argued that the effects of the commodity price boom on African countries' economic growth is generally negative, and according to Collier and Gunning (2005), oil-exporting developing countries should utilize their oil resources to accumulate assets that are necessary to sustain growth, while the natural resource may be depleted. Thus, the governments can utilize the natural resources money for asset development by prioritizing domestic debt repayment since the governments tend to control natural resources through ownership and taxation in developing countries (Collier and Gunning 2005).

Hammond (2011) stressed that resource-rich developing countries failed to develop due to the political conditions under which the resources are exploited, although the size and volatility of oil rent also encouraged corruption and mismanagement of resources and power. In the cases of Angola and Venezuela, Hammond (2011) suggested that a political revolution was necessary to foster sustainable development because corruption inhibited the governments to serve the interests of the population.

Empirical evidence suggests that an average annual real GDP growth of 1.8% between 1980 and 1989 to 4.4% between 2000 and 2005 of the African economy was due to the macroeconomic stabilization and financial-market liberalization policies adopted in the 1990s and the effect of the boom in international prices of primary commodities such as oil and copper (Beny and Cook 2009). In the same vein, Ee (2016) relates the export-led growth in selected Sub-Saharan African countries to the stability of the countries' macroeconomic environment, improved infrastructure, growing agricultural productivity, and having a diversified export sector.

Bbaale and Mutenyo (2011) found that export-led growth was driven by agricultural exports, unlike manufacturing exports in Sub-Saharan Africa. Hence, they concluded that Sub-Sahara African economies might enhance their medium-term growth by expanding their agricultural exports, while they design appropriate long-term strategies to increase the export of manufacturing products. Essaied (2013) found two-way effects between exports and real GDP growth in Tunisia between. Further, Ojide et al. (2014) also found that non-oil exports in Nigeria had a positive impact on economic growth. These studies show that export-led growth can be possible for African counties if they developed their infrastructure, maintained a stable macroeconomic environment, and took advantage of a boom in natural resources.

Studies have also shown that Africa's manufacturing exports have the potential to foster economic growth. Bigsten et al. (2004) argued that the potential for gains from exporting is large in African economies that have liberalized their trade. The manufacturing sector is vital for industrialization in Africa by focusing on the export market because the domestic market for manufacturing products are very small. By exporting, African economies can improve their competitiveness through learning by doing. Bigsten et al. (2004) then investigated the impacts of exporting on efficiency gains in Cameroon, Ghana, Kenya, and Zimbabwe in a panel analysis, and found a positive correlation between efficiency gains and exporting. Van Biesebroeck (2005) used firm-level data in a panel of nine African countries namely Ethiopia, Tanzania, Burundi, Zambia, Kenya, Ghana, Cote d'Ivoire, Cameroon, and Zimbabwe. Van Biesebroeck (2005) found that exporters in these countries were more productive, capital intensive and operated at a larger scale, as well as paid higher wages than non-exporters. The productivity gains in the manufacturing sectors were driven by returns to scale after firms entered the export market.

Contrary, Toyin (2016) studied the impact of agricultural exports on economic growth and found no correlation between them, suggesting that agricultural exports were too small to stimulate growth in South African between 1975-2012. Ndoricimpa (2014) attributes the nonexistence of export-led growth in 15 out of 17 African countries of the Common Market for Eastern and Southern Africa (COMESA) to the concentration of exports in primary commodities. Similarly, Tekin (2012) also did not find export-led growth in 16 LDCs except for Haiti and Sierra Leone where the manufacturing exports tended to drive economic growth.

Furuoka (2018) related the ambiguity of findings from previous studies in Africa to methodological problems. After using innovative econometric methods such as the Fauria Augmented Dickey-Fuller test, the Granger, Sims and Gewek causality tests with data from 24 Sub-Sahara African countries between 1980-2013, the results showed that a causal relationship was present in five countries only, but it was unstable in the four countries (Furuoka 2018).

Empirical evidence also shows that oil exports, especially in African countries have adverse effects on non-oil sectors. Apergis et al. (2014) investigated the effects on oil rent on agricultural value added for the Middle East and North African (MENA) countries and found that oil rent had a negative correlation with agricultural value added. Similarly, Karamelikli et al. (2017) who found a negative relationship between oil exports and economic growth in Nigeria, Iran, and Iraq among other members of the Organization of the Petroleum Exporting Countries (OPEC), and attributed the negative results to conflict and corruption.

Export and Economic Growth in Angola

Karamelikli et al. (2017) found that the effects of Angola's oil exports on real GDP growth were insignificant, which were consistent with Tekin's (2012) findings. Tekin (2012) concluded that economic growth might be correlated with the growth rate of the world, so that an increase in exports may be determined by an increase in global demand for the natural resource during a period of the resource boom.

Solarin et al. (2016) found a unidirectional positive causal relationship between exports and economic growth in the long run, and a bidirectional relationship in the short-run in Angola. While Karamelikli et al. (2017) and Tekin (2012) did not find evidence for export-led growth in panel analysis, Solarin et al. (2016) used time series analysis in the study about the relationship between electricity consumption and economic growth, taking into account the effects of exports.

From the literature, exports may affect economic growth in low-income countries differently, depending on the structure of the export sector, institutional efficiency, and endowment of productive capacities such as skilled labor and technology. Developing countries endowed with abundant natural resource can be susceptible to Dutch Disease, but Bjørnland and Thorsrud (2016) demonstrate that the natural resource sector can have positive spillovers to the rest of the economy and foster growth. No study was found that seeks to explain the effects of exports on economic growth in Angola using disaggregated export data.

CHAPTER III

METHODOLOGY

This chapter outlines the theoretical approach to the analysis of exports and economic growth. The chapter also procedures and models used to estimate the long run and short-run effects of agricultural, manufacturing, and mineral exports on economic growth in Angola.

Conceptual Framework

The export-led growth hypothesis is used in this study to explain the effects of increasing exports on economic growth. Increasing exports improves a country's productivity and output (Dreger and Herzer 2013; Ribeiro et al. 2016) based on the channels detailed in the previous section. Therefore, Angola's economic growth can be assumed to be determined by exports, holding other things constant. Thus, an increase in agricultural, manufacturing, and minerals exports are expected to positively influence economic growth.

An increase in manufacturing exports is expected to positively influence economic growth by stimulating technological advancements and human capital improvements (Kalaitzi & Cleeve, 2018). Although manufacturing exports account for a small share of Angola’s total exports, their effects on economic growth are expected to be positive because of the sector’s potential to provide positive externalities to the rest of the economy. An increase in primary agricultural exports is also expected to positively influence economic growth by expanding the use of dormant resources such as land and labour (Sheridan, 2014). The effects of mineral exports on economic growth depends on whether Dutch disease is present in an economy or not. Thus, positive growth effects of increasing mineral exports imply no Dutch disease, and negative growth effects of increasing mineral exports imply Dutch disease is present in the economy (Beny and Cook 2009).

The Autoregressive Distributed Lag Model

An Auto Regressive Distributed Lag (ARDL) model developed by Pesaran et al. (2001) can be used to determine the effects of lags of agricultural, manufacturing, and mineral exports on GDP growth in Angola. This method has been used by Ali and Li (2018) and Shafiullah et al. (2017) to determine the effects of exports on economic growth because of its advantages over other cointegration methods. The ARDL model is useful when the sample data is small, and when variables are integrated in order I (0), I (1) or both (Shahbaz et al. 2013), while other techniques such as Johannsen's cointegration can be more applicable to large sets of data, and when all variables are integrated in the same order (Shafiullah and Navaratnam 2016).

According to Pesaran and Shin (1997) and Pesaran et al. (2001) as cited by Mervar and Payne (2007), the general specification of the ARDL model takes the form

$$\alpha(L,P)Y_t = \alpha_0 + \sum_{i=1}^{k} \beta_i\,(L,q_i)x_{it} + \lambda' w_t + \varepsilon_t \tag{1}$$

where Y_t is the dependent variable, α_0 is the constant x_{it} is a vector of independent variables, L is the lag operator and w_t is a vector of deterministic variables such as the time trend, dummy variables, and exogenous variables; $\alpha(L,P) = 1 - \alpha_1 L - \ \alpha_2 L^2 -$

$\cdots - \alpha_p L^p$ and $\beta_i(L, q_i) = 1 + \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + \cdots \beta_{iqi}L^{qi}$. Equation 2 gives the long-run elasticities based on the ARDL model.

$$\hat{\theta}_i = \frac{\hat{\beta}_i(L, \hat{q}_{i1})}{\hat{\alpha}_1(L, \hat{p})} = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + \cdots + \hat{\beta}_{qi}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \cdots - \hat{\alpha}_p} \qquad i = 1,2,\ldots,k. \tag{2}$$

The estimation procedure involves first, testing for unit root to determine if the variables are stationary at levels I (0) or after first difference transformation I (1). If some variables are I (2), the ARDL model cannot be used. Stationary variables have no unit root, they mean reverting with a constant variance, and are useful in time series analysis to avoid spurious regression results.

Second, testing for cointegration to determine if a long run relationship between the variables exist. An Autoregressive Distributed Lag (ARDL) bounds test for co-integration is used because of the reasons given above. A third step involves estimating an error correction model based on the ARDL framework to obtain the short-run and long-run results.

The estimation procedure involves first, testing for unit root to determine if the variables are stationary. Stationarity of the variables entails that the time series are mean reverting and have constant variance. Stationary variables are used to avoid spurious regression results. The Augmented Dickey-Fuller (ADF) unit root test is used to determine if the variables are stationary. Second, an Autoregressive Distributed Lag (ARDL) bounds test for co-integration is conducted to determine if a long run relationship between the variables exist, and finally, an error correction model based on the ARDL framework model is estimated to obtain the short-run and long-run elasticities.

This study applied an ARDL model specification given by Shafiullah et al. (2017), which included four categories of merchandise exports namely agriculture, mining and fuels, manufacturing, and other exports as independent variables. For this study, four models ere estimated, which include Models 1 and 3 use nominal GDP, and nominal GDP net of exports, respectively, as dependent variables, and agricultural, manufacturing, and mineral exports as independent variables. Models 2 and 4 also use nominal GDP, and nominal GDP net of exports, respectively, for dependent variables, and mineral exports and non-mineral exports for independent variables. Nominal GDP net of exports is used following Dreger and Herzer (2014) who criticized the use of GDP to test the export-led growth hypothesis because exports are a part of GDP. A representation of the ARDL model with agricultural, manufacturing and mineral exports for independent variables, and nominal GDP for independent variable can be expressed as

$$\Delta \ln Y_t = \alpha + \beta_1 \ln Y_{t-1} + \beta_2 \ln XA_{t-1} + \beta_3 \ln XM_{t-1} + \beta_4 \ln XP_{t-1} + \beta_5 \mathrm{D}_t + \sum_{i=1}^{n} \gamma_i \Delta \ln Y_{t-i} + \sum_{j=0}^{n} \gamma_j \Delta \ln XA_{t-i} + \sum_{m=0}^{n} \gamma_m \Delta \ln XM_{t-i} + \sum_{k=0}^{n} \gamma_k \Delta \ln XP_{t-i} + u_t \quad (3)$$

where the variables $\ln Y_t, \ln XA_{t-1} \ln XM_t, \ln XP_t$ represent the natural log of GDP, Agricultural exports, manufacturing exports, and mineral exports in time t. α is an intercept term, $\beta_1, \ldots, \beta_4$ represent long-run parameters, and $\gamma_1, \ldots, \gamma_4$ represent short-run dynamics. n represents the lag length for the differenced explanatory variables, which are denoted with a prefix Δ. D_t is a dummy variable to account for structural breaks. The term u_t denotes the error term assumed to be independent and with a constant variance.

Model 3 is used to conduct the bounds test for cointegration under a null hypothesis of no co-integration among the variables, i.e., H_0: $\beta_2 = \beta_3 = \beta_4 = 0$, while the alternative hypothesis is that the model variables are co-integrated, i.e., H_1 : At least one $\beta_i \neq 0$. The joint significance of the lagged level coefficients is tested using the Wald test's F-statistic. The null hypothesis can be rejected if the calculated F-statistic is greater than the upper bounds critical values for small samples given by Narayan (2005). That means a long run relationship between the variables exists. The null hypothesis cannot be rejected if the F-statistic is less than the lower bound critical values. If the calculated F-statistic lies between the critical bounds, then the regression results will be inconclusive (Pesaran et al. 2001).

If the variables are co-integrated, then an error correction model, which includes a lagged error correction term, and differenced variables at a selected lag length (i) can be used to determine the long-run and short-run effects. The error correction model from the ARDL framework can be expressed as

$$\Delta \ln Y_t = \theta + \sum_{i=0}^{n} \vartheta_{1i} \Delta \ln Y_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta \ln XA_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta \ln XM_{t-i} + \sum_{i=0}^{n} \delta_{4i} \Delta \ln XP_{t-i} + \varphi \mathrm{ECT}_{t-1} + D_t + u_t \quad (4)$$

where all the variables are defined in equations 3, $ECT_{(t-1)}$ represents the lagged error correction term, whose coefficient φ shows the speed of adjustment for variables to return to long run equilibrium after a shock. The estimated coefficients of agricultural, manufacturing, and mineral exports can be interpreted as elasticities since all variables in the model are in natural logarithm from. Positive and statistically significant coefficients of the exports variables satisfy the export-led growth hypothesis.

The following model diagnostics are done: The cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests to for stability of estimates, Breusch-Godfrey LM test for autocorrelation, White's test for homoscedasticity and Jarque-Bera test for normality, and the Ramsey RESET test for the functional form (Pesaran et al. 2001).

The Johansen cointegration test can be performed to check the robustness of the ARDL bounds test results (Shahbaz et al. 2013). A representation of a multivariate error correction model is given in equation (4) is used to conduct the Johansen integration test, following (Awokuse, 2003)

$$\Delta Y_t = \mu + \sum_{i=1}^{p-1} \vartheta_i \Delta \mathrm{Y}_{t-i} + \varphi Y_{t-1} + \varepsilon_t \tag{3}$$

where Y_t is a (n x 1) vector of p variables, μ is an (n x 1) vector of constant terms, ϑ and φ are coefficient matrices, for which φ matrix contains long-run relationship information. Δ is a difference operator, K denotes the lag length, and ε_t denotes the error term. The model can be estimated to determine the long-run and short-run effects if there is a cointegrating vector. Otherwise, a short run Vector Autoregression (VAR) model can be estimated.

CHAPTER IV

RESULTS

This section provides the estimation results. First, the Dickey Fuller, and Zivot and Andrews unit root tests were conducted to determine if the variables are stationary. Second, an Autoregressive Distributed Lag (ARDL) bounds test for cointegration was done to determine if a long-run relationship exists among the variables. Then an error correction model was estimated to determine the long run and short run effects of agricultural, manufacturing, and mineral exports on economic growth in Angola. The Johansen cointegration test, a vector error correction model was estimated to check the robustness ARDL results.

Variables Description

Annual time series of agricultural, manufacturing, mineral exports and GDP data of Angola ranging from 1980 to 2017 are used in this study. The period of the series is based on data availability. Agricultural and mineral (fuels and mining) exports data are retrieved from the World Trade Organization (2019) database, and are based on the Standardized International Trade Classification (SITC) revision three. Due to data limitations, manufacturing exports are based on WTO data and World Development Indicators data. While WTO manufacturing data had unexplainable spikes and troughs, and gave a nonnormally distribution, the WDI data was used instead to linearly interpolate missing values and correct for normality. Agricultural exports include primary agricultural products. Mineral exports include primary fuels and mining products. Nominal GDP data are retrieved from the World Development Indicators database of the World Bank (2019).

Table 1. Variables

Variable	Name	Description	Source
lnY	GDP	Natural log of gross domestic product at current US$ prices	WDI of World Bank
lnY1	GDP net of exports	Natural log of the difference of Gross domestic product and total exports at current US$ prices	WTO / WDI
lnXA	Agricultural exports	Natural log of primary agricultural products (SITC sections 0, 1, 2, 4 minus 27 and 28) at current US$ prices	WTO
LnXM2	Manufacturing exports	Natural log of manufacturing products in SITC sections 5, 6, 7, 8, minus 68 and 891 at current US$ prices	WTO / WDI of World Bank
lnXAM	Non-mineral exports	Natural log of the sum of agricultural exports and manufacturing exports	WTO / WDI data
lnXP	Minerals exports	Natural log of primary fuels and mining products (SITC sections 27, 28, 3 and 68) at current US$ prices	WTO

Note: SITC stands for Standardised International Trade Classification. All exports data are classified according to the CITC revision 3.

The data are transformed into natural logs so that the natural log of GDP can be used as proxy for economic growth, and the increase in exports can be expressed as natural logs of agricultural, manufacturing, and mineral exports. Agricultural and manufacturing exports were also added to form a non-mineral exports variable.

Missing values of manufacturing exports data were estimated using linear interpolation. The data variables are denoted by lnY, $lnXA$, $lnXM$, $lnXAM$, and $lnXP$ to represent the natural logs of nominal GDP, agricultural exports, manufactured exports, non-mineral exports, and petroleum oil exports, respectively.

Summary Statistics

Table 2. Descriptive Statistics (1980-2017, in Natural Logs)

Variable	lnY	lnY1	lnXP	lnXAM	lnXM2	lnXA
Mean	23.635	22.876	22.793	19.056	18.581	17.563
Std. Dev.	1.229	1.308	1.353	1.217	1.609	0.563
Min	22.214	20.719	20.942	16.270	14.686	16.041
Max	25.705	25.195	24.964	20.819	20.788	18.933
Skewness	0.582	0.407	0.369	-0.397	-0.505	-0.557
Kurtosis	1.642	2.072	1.624	2.379	2.464	4.157
Jarque-	5.060*	2.414	3.859	1.607	2.068	4.085
Bera	(0.079)	(0.299)	(0.145)	(0.448)	(0.356)	(0.130)

Note: * represent statistical significance at the 10%, level. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

Descriptive statistics are reported in tables (2). The time series are normally distributed with constant variance, and zero mean based on the Jarque-Bera statistics at 5% level of significance. The share of Angola's manufacturing and agricultural exports in total exports is very small, whose effects on GDP growth may be superseded by the dominant mineral exports. Ndoricimpa (2014) suggested that the lack of correlation between agricultural exports and economic growth in South Africa was due to the small share of agricultural exports in total exports. In this study, the small shares of agricultural and manufacturing exports were added up to form a non-mineral exports variable denoted by (lnXAM).

Table 3. Correlations Between Export Variables and GDP Growth (1980-2017)

	lnY	lnY1	lnXP	lnXM2	lnXAM	lnXA
lnY	1.000					
lnY1	0.945	1.000				
lnXP	0.954	0.811	1.000			
lnXM2	0.750	0.722	0.682	1.000		
lnXAM	0.756	0.726	0.692	0.996	1.000	
lnXA	0.026	0.067	-0.049	0.522	0.534	1.000

lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

The correlation matrix shows that mineral exports and manufacturing exports are positively correlated with nominal GDP growth and nominal GDP growth net of exports. the correlation between agricultural exports and nominal GDP growth or nominal GDP growth net of exports is not significant. Mineral exports are positively correlated with manufacturing exports, while, manufacturing exports positively correlate with agricultural exports.

The trends in nominal GDP (lnY), nominal GDP net of exports (lnY1), and exports variables are presented in Figures 2. Nominal GDP trended upwards after the year 2000 indicating faster growth than years before 2000. The upward trend in GDP tends to follow minerals exports trend. Manufacturing exports trended upwards since the 1990s, agricultural exports trend is flatter than manufacturing and mineral exports, but some upward growth can be observed after the year 2010. Non-mineral exports tend to trend upwards after 1990 and tends to follow the trends in mineral exports and GDP. Generally, after 2002, Angola's economy grew faster, following the boom in petroleum prices in the same period.

Unit Root Tests

It is important in time series analysis to find out whether variables are stationary or not. A variable is stationary when its mean, variance, and autocorrelation are stationary. Stationary variables can be used in a regression to avoids spurious results. In this study, the Augmented Dickey-Fuller unit root test was conducted to determine if the variables are stationary.

The results in table (4) show that the variables are non-stationary in levels. however, all the variables (i.e., manufacturing exports mineral exports, non-mineral exports, agricultural exports, and nominal GDP variables) are stationary after taking their first difference.

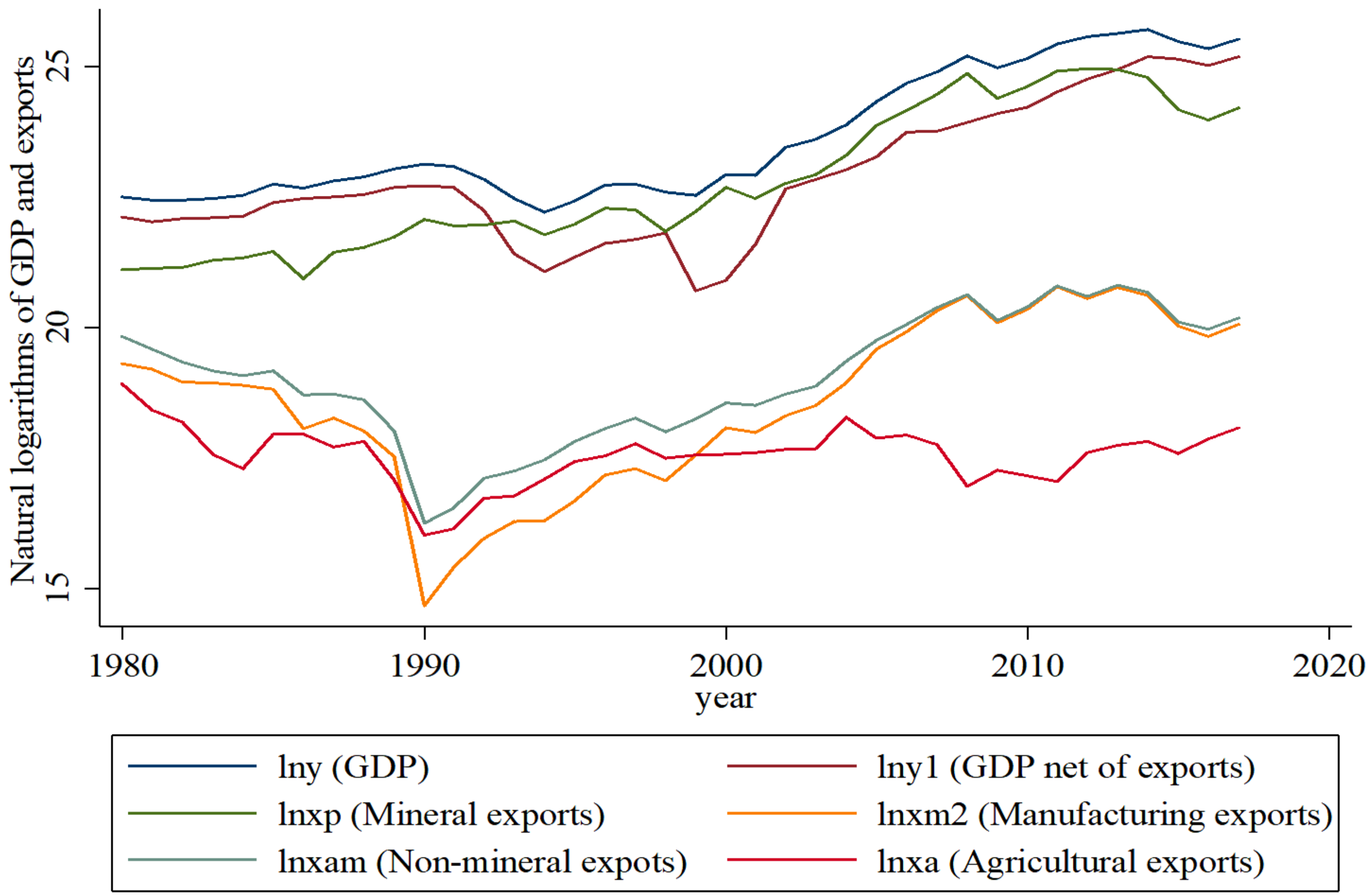

Figure 2. Trends in Nominal GDP and Manufacturing Exports
Source: Author, with data from World Trade Organization database and World Development Indicators database.

The ADF test does not account for structural breaks. Thus, the Zivot and Andrews (1992) unit root test, which accounts for one unknown structural break was conducted. The results presented in tables (5) confirm the robustness of the ADF unit root results. The unit root results imply that the variables are integrated in order 1(1). A break in nominal GDP and nominal GDP net of exports was found in 2002 and 19992 respectively, by the Zivot and Andrews (1992) unit root test.

Table 4. Augmented Dickey-Fuller Unit Root Test Results (Data 1980-2017)

Variable	Levels		First difference	
	t.stat	Lags	t.stat	Lags
lnY	-1.729	2	-4.266 **	0
lnY1	-1.380	2	-4.139**	1
lnXA	-2.894	1	-5.396 ***	0
lnXP	-1.793	1	-5.659***	0
lnXM2	-2.050	1	-5.535***	0
lnXAM	-0.906	2	-4.587***	0

Note: *, **, *** represent statistical significance at 10%, 5% and 1% levels. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

Table 5. Zivot and Andrews Unit Root Test Results, with One Structural Break (Data 1980-2017)

Variable	Levels			First difference		
	t-statistic	Break	Lags	t-statistic	Break	Lags
lnY	-3.265	2002	1	-5.445***	2000	0
lnY1	-4.042	1992	1	-6.562***	2000	2
LnXA	-3.991	1989	1	-6.005***	1991	0
lnXP	-3.054	2004	0	-6.750***	2009	0
lnXM2	-3.027	1989	0	-7.180***	1992	0
lnXAM	-3.736	1989	1	-6.227***	1991	0

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

The 1992 break can be associated with the revamp of civil war after Angola's first elections in 1992, whose results were rejected by the opposition party Union for the Total Independence of Angola (UNITA). The second dummy in 2002 can be associated with the end of civil war and economic reforms after that.

ARDL Bounds Test for Co-Integration

The Autoregressive Distributed Lag (ARDL) model bounds test for cointegration was conducted to determine if the variables in question have a long-run relationship. The Akaike information criterion (AIC) was used to select the lag order for the ARDL model. Liew (2004) suggested that the AIC can be more appropriate for small samples of 60 observations and below than the BIC. A maximum of two lags was used in order to avoid serial correction and loss of degrees of freedoms since annual time series are used

(Wooldridge 2015). Based on the AIC, the lag orders (1,2,2,2) and (2,1,1,1) corresponding with the variables (lnY, lny1 lnXP, lnXM, and lnXA), and (2,1,2) and (2,1,1) corresponding with the variables (lnY, lnXP, and lnXAM were selected for models 1, 2, 3 and 4.

Table 6. ARDL Bounds Test for Co-Integration (Case 3) Results

			Diagnostics	
Model (lag order)	Dummy	F-stat	R^2	Adj- R^2
1. lnY, ARDL(1,2,2,2)	2002	5.270*	0.830	0.750
2. LnY1, ARDL(2,1,1,1)	1992	5.723**	0.538	0.378
3. lnY, ARDL(2,1,2)	2002	4.557*	0.782	0.717
4. lnY1, ARDL(2,1,1)	1992	6.034**	0.471	0.339
Narayan (2005) Critical Values	5%	I(0) 4.183	I(1) 5.333	
	10%	I(0) 3.393	I(1) 4.410	

Note: **, * denote significance at 5% and 10% levels. I(0) and I(1) denote lower and upper bounds critical values. Lag order was selected by minimizing the Akaike Information Criterion. lnY, lnY1, denote natural logs of GDP, GDP net of exports.

The ARDL bounds tests for cointegration results are presented in table 6. A long-run relationship among variables exits if the calculated F-statistic is greater than the I (1) upper critical bounds for small samples given by Narayan (2005). Table 6 shows that models 1 and 3 are cointegrated at 10 % level, and models 2 and 4 are cointegrated at 5 % level. Therefore, long run relationships between agricultural, manufacturing, mineral exports, non-mineral exports on one hand, and GDP growth and GDP growth net of exports on the other hand exist.

Table 7. ARDL Results; Long-Run Effects of Agricultural, Manufacturing and Mineral Exports on GDP Growth, 1980-2017

Model	Model 1	Model 2	Model 3	Model 4
Dependent variable	lnY	LnY1	lnY	lnY1
Long-run Elasticities				
lnXA	0. 171 (0. 303)	0.858 (0.549)		
lnXM2	0.255** (0.116)	-0.189 (0.266)		
lnXP	0.553*** (0.075)	1.510*** (0.359)	0.488*** (0.168)	1.078*** (0.257)
LnXAM			0.345** (0.129)	0.228 (0.224)

Note: **, *** represent statistical significance at the 5% and 1% levels. Standard errors are presented in parenthesis. Model diagnostics are in the Appendix 1. lnY, lnY1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

Table 8. ARDL Results; Short-Run Effects of Agricultural, Manufacturing and Mineral Exports on GDP Growth, 1980-2017

Model	Model 1	Model 2	Model 3	Model 4
Dependent variable	lnY	LnY1	lnY	lnY1
lnXA	0.092 (0.069)	0.331* (0.189)		
$lnXA_{t-1}$	0.112* (0.065)			
lnXM2	-0.044 (0.042)	-0.088 (0.109)		
$lnXM2_{t-1}$	-0.142***(0.044)			
lnXP	0. 171(0. 303)	0.219 (0.194)	0.468***(0.078)	0.091 (0.185)
$lnXP_{t-1}$	0.167***(0.043)			
LnXAM			0.019 (0.057)	0.063 (0.146)
$LnXAM_{t-1}$			-0.103* (0.057)	
D2002	-0.169* (0.096)		0.185* (0.098)	
D1992		-0.779*** (0.271)		-0.531** (0.236)
Constant	1.775 (0.661)	-7.877* (4.238)	1.328 (0.874)	-1.633 (1.140)
$ECT_{(t-1)}$	-0.248*** (0.075)	-0.368*** (0.087)	-0.231*** (0.076)	-0.342*** (0.088)

Note on table 8: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are in parenthesis. D2002 and D1992 represent structural breaks dummy variables. $ECT_{(t-1)}$ is the error correction term, its coefficient shows the speed of adjustment for variables to return to long-run equilibrium after a shock. Model diagnostics are presented in Appendix 1. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

ARDL Results; Short-Run and Long-Run effects of Agricultural, manufacturing, and Mineral exports on GDP Growth

An Error Correction Model based on the ARDL framework was estimated, and the long-run results are presented in table 7. The results suggest mineral exports affected GDP growth and GDP growth net of exports positively in the four models. Non-mineral exports and manufacturing exports affected GDP growth positively, but their effects on GDP net of exports were statistically insignificant in the long run. Agricultural exports had no significant effects on GDP growth and GDP net of exports in the long run. By theory, positive effects of exports on GDP growth support the export-led growth hypothesis. Based on these results, export-led growth in Angola between 1980-207 was determined by mineral, non-mineral, and manufacturing exports.

The positive effects of mineral exports on GDP growth suggests that Angola may not be a victim of resource curse. However, little can be learned about Dutch disease and resource curse from this study by using nominal data. The growth in GDP may reflect a mere increase in commodity prices.

The manufacturing industry in Angola is among the fastest growing sector, although its contribution to GDP, and its share in total exports has remained small. Theory suggest that the manufacturing sector provide positive externalities to the rest of the economy by promoting technological advancements and human capital development, which are essential to enhance productivity of an economy. According to (Wolf 2017), the growth of the sector is driven by growing domestic demand for construction materials. However, exports have been led by the beverages industry.

The ARDL long run results also show that agricultural exports have no effects on GDP growth and GDP net of exports. A possible reason can be associated to the small share of agricultural exports in total exports. lack of correlation between agricultural exports and economic growth was also found by Toyin (2016) because agricultural exports for South Africa were too small to stimulate growth between 1975-2012. After aggregating agricultural exports and manufacturing exports, the ARDL results in this study show a positive and significant effects of non-mineral exports on GDP growth. Promoting agricultural exports in Angola is essential if the main objective is to alleviate poverty because over 75% of Angola’s households are employed in agriculture. In addition, there is need to improve the competitiveness of the sector in order to attract foreign demand. Wanda (2017) showed that only about 2% of non-oil FDI inflow to Angola was channeled to the agricultural sector between 2003 and 2003. Overall, non-mineral exports have potential to positively stimulate growth in Angola.

In the short run, the lags of agricultural and mineral exports positively affected GDP growth, (See table 8), while manufacturing and non-mineral exports had negative effects on GDP. The effects of agricultural exports on GDP net of exports were also positive. The break dummy for 2002 positively affected GDP growth net of exports, suggesting that the end of Angola's civil war in 2002, economic reforms and a boom in oil prices in the early 2000s can be attributed to the positive growth. On the other hand, the effects of the break dummy for 1992 is negative, suggestive of the negative impacts of the revamp of Angola's civil war in 1992 on economic growth.

Johansen Co-Integration Test

The Johansen co-integration test was conducted with a dummy variable to account for a structural break (Shahbaz 2013). The test was done to check the robustness of ARDL model results. Models 1, 2, 3 and 4 (as described earlier) were tested for cointegration with a trend and intercept, and the results are presented in table 9. Based on the trace statistics, models 1, 2 and 3 had one cointegrating equation, while model 4 had none. The results suggest that the ARDL bounds teste for cointegration results are robustness for models 1, 2, and 3.

Table 9. Johansen's Co-Integration Test Results, 1980-2017

	Model 1	Model 2	Model 3		Model 4	
	lnY	LnY1	lnY	Critical values	LnY1	Critical values
Ho	Trace	Trace	Trace	5%	Trace	5%
R = 0	50.081	49.219	47.432	47.21	19.341*	29.68
R ≤ 1	23.631*	16.665*	22.956*	29.68	3.404	15.41
R ≤ 2	12.050	6.447	11.401	15.41	0.124	3.76
R ≤ 3	5.1204	0.004	4.614	3.76		

Note: * indicate cointegration at 5% level. lnY, lny1 denote natural logs of GDP, GDP net of exports.

Vector Error Correction Model (VECM); Long-Run and Short-Run Results

A vector error correction model (VECM) was estimated to determine the long-run and short-run effects of agricultural, manufacturing, and mineral exports on nominal GDP growth and nominal GDP growth net of exports after finding the cointegrating ranks for models 1, 2, and 3. A vector autoregressive (VAR) model was also estimated for model 4 with first differenced variables to determine short-run effects of mineral and non-mineral exports on nominal GDP net of exports. The vector error correction model long-run results are presented in table 10.

Table 10. Vector Error Correction Model (VECM), Long-Run Results Summary

Dep Variables	Model 1	Model 2	Model 3
	lnY	lnY1	lnY
lnXA	0.447* (0.239)	1.574*** (0.334)	
lnXM2	0.171* (0.102)	-0.907*** (0.243)	
lnXP	0.613*** (0.151)	2.491*** (0.340)	0.331** (0.137)
lnXAM			0.275*** (0.104)

Note: *, **, *** denotes statistical significance at 10%, 5% and 1% levels. Standard errors are in parenthesis. Model diagnostics and full results are the Appendix 2. lnY, lnY1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

The long-run VECM results suggest that agricultural, manufacturing, and mineral, and non-mineral exports positively influenced GDP growth. The effects of agricultural and mineral exports on GDP growth net of exports were positive, but the effects of manufacturing and non-mineral exports on GDP growth net of exports were negative. Overall, the VECM long-run results tend to confirm the robustness of the ARDL long run results. However, the two methods may not be perfectly comparable because the ARDL can be suited to small samples, while the VECM to large samples.

Table 11. Vector Error Correction Model (VECM), Short-Run Results Summary

	Model 1	Model 2	Model 3
Dependent variables	lnY	LnY1	lnY
lnY	-0.008 (0.239)		0.031 (0.224)
LnY1		0.277* (0.148)	
lnXA	0.059 (0.094)	-0.034 (0.170)	
lnXM2	-0.107 (0.066)	0.228 (0.150)	
lnXP	0.129 (0.174)	-0.252 (0.313)	0.078 (0.159)
lnXAM			-0.103 (0.078)
D1992		-1.099** (0.424)	
D2002	0.191*** (0.072)		0.412*** (0.099)
Constant	-0.003 (0.042)	-0.171 (0.134)	-0.008 (0.040)
ECT_{t-1}	-0.263*** (0.078)	-0.283 (0.101)	-0.323 (0.081)

Standard errors are in parenthesis. D2002 and D1992 represent structural breaks dummy variables. $ECT_{(t-1)}$ is the error correction term, its coefficient shows the speed of adjustment for variables to return to long-run equilibrium after a shock. Model diagnostics and full results are presented in Appendix 2. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

The short-run results from the VECM and VAR are presented in tables 11 and table 12. There were no significant effects of agricultural, manufacturing and mineral exports on GDP growth and GDP growth net of exports, but mineral exports had a positive effects on GDP net of exports after one lag.

Table 12. Results of a VAR models with lag (1)

Dependent variables	lnY	LnXP	lnXAM
$LnY1_{t-1}$	0.667*** (0.084)	0.003 (0.084)	0.022 (0.106)
$lnXP_{t-1}$	0.373*** (0.121)	0.899*** (0.121)	-0.112 (0.152)
$lnXAM_{t-1}$	0.084 (0.065)	0.041 (0.065)	0.982*** (0.082)
D1992	-0.489** (0.209)		
Constant	-2.074** (1.003)	1.385 (0.997)	1.941 (1.260)

Note: ** and ***represent statistical significance at the 5% and 1% levels. Standard errors are presented in parenthesis. Model (A) includes nominal GDP, and model (B) includes nominal GDP net of exports.

Overall, the results in this study support the findings by Solarin et al. (2016), who found a positive correlation between exports and economic growth in Angola using time series analysis. However, the results are contrary to the findings of Karamelikli et al. (2017) and Tekin (2012) in panel analysis. The results in this study also suggests that the effects of exports on economic growth vary across sectors. Therefore the study provides a more detailed results based on agricultural, manufacturing, mineral sectors, other than aggregate exports as used in previous studies.

The positive and significant effects of mineral exports on economic growth in Angola based on this study suggest that the claim by Collier’s (2006), that the effects of a boom in natural resources on the economic growth of African countries on average are significantly negative cannot be supported. However, the effects of Dutch disease may be detected if real GDP growth data is used. Thais study used nominal GDP data and did not find evidence for Dutch disease in Angola.

CHAPTER V

CONCLUSION

The objective of this study was to determine the effects of agricultural, manufacturing, and mineral exports on GDP growth in Angola. Angola is rich in natural resources such as petroleum and diamonds, but over 30% of the Angolan population live below the poverty line of $US1.9 per day. Since the 1970s when petroleum became the leading export sector of the economy, growth in non-petroleum sectors has lagged. Many factors contributed to the loss of competitiveness in manufacturing and agricultural sectors. According to Colier (2006), lack of growth of resource-rich African countries is a result of dysfunctional institutions and corruption.

As a result of unstable patterns of Angola's economic growth, the Government of Angola has opted to diversify the economy, by promoting private investments in non-minerals sectors such as agriculture and manufacturing sectors, and their exports. The diversification strategy is meant to reduce the effects of international commodity price shocks on the economy because Angola’s economy depends on petroleum exports.

The export-led growth hypothesis was used to explain the growth effects of increasing Angola's exports on economic growth. An autoregressive distributed lag was used to determine the long run and short run effects of agricultural, manufacturing, and mineral exports on economic growth in Angola. The bound test for co-integration results suggested that a long run relationship between the variables exist. An error correction model based on the ARDL framework was estimated in four cases namely models 1, 2, 3 and 4.

The ARDL bounds test for cointegration results showed that long rung relationship between agricultural, manufacturing, mineral, non-mineral exports, and GDP growth existed. Long-run results from the error correction model suggested that mineral exports had positive and significant effects on nominal GDP growth and on GDP growth net of exports. Manufacturing exports and non-mineral exports had positive effects on GDP growth, but their effects on GDP growth net of exports were statistically insignificant. The results are suggestive of export-led growth determined by mineral exports, non-mineral exports and manufacturing exports. In the short-run, one lag of agricultural exports and mineral exports positively affected GDP growth and GDP, while the lags of manufacturing exports and non-mineral exports had adverse effects on GDP growth.

The Johansen cointegration test, and a vector error correction model were used to check the robustness of the ARDL results. The cointegration test showed that a long run relationship among the variables existed for models 1, 2, and 3. The Vector Error Correction Model results are supportive of the ARDL results, but for the effects of manufacturing exports on GDP net of exports. The two methods may not be perfectly comparable because the ARDL model can be useful for small data samples used in this study, while the Johansen cointegration test, and a vector error correction model are more applicable when the sample is large.

Overall, the findings of this study are suggestive of export-led growth in Angola between 1970-2017 based on nominal data. The results in this study also suggests that the effects of exports on economic growth vary across sectors. Therefore the study provides better understanding of the effects of agricultural, manufacturing, mineral sectors, in contribution to previous studies that used aggregated exports.

The results of this study also support the export promotion policies implemented by the Angolan government. In both ARDL and VECM, the effects of non-mineral exports on GDP was found to be positive. The effects of mineral exports are relatively larger than non-mineral exports. Therefore, the mineral sector can play an important role to support the growth of non-mineral sectors, by using the oil rent to finance development projects and human capital. There is need for the government of Angola to ensure effective evaluation of the development projects and enhance institutional capacity for development in order to benefit from exports.

Study Limitations

The major limitation encountered in this study was lack of adequate data. Exports data from the Word Trade Organization was used, but it is based estimations for some time periods unlike real field data. In addition, the export data available only ranges from 1980 to 2017. Other data sources such as the Institute of National Statistics database for Angola, the UN Comtrade database, and the World Bank databases were consulted. Since Angola sustained many years of civil war from 1976 to 2002, the data in this period may not be very reliable because there were limited formalities for data reporting. Due to the data limitations, the empirical models in this study were estimated with nominal data to satisfy model diagnostics, and improve the quality of estimates the results. Therefore, interpretation of the results must be made with caution.

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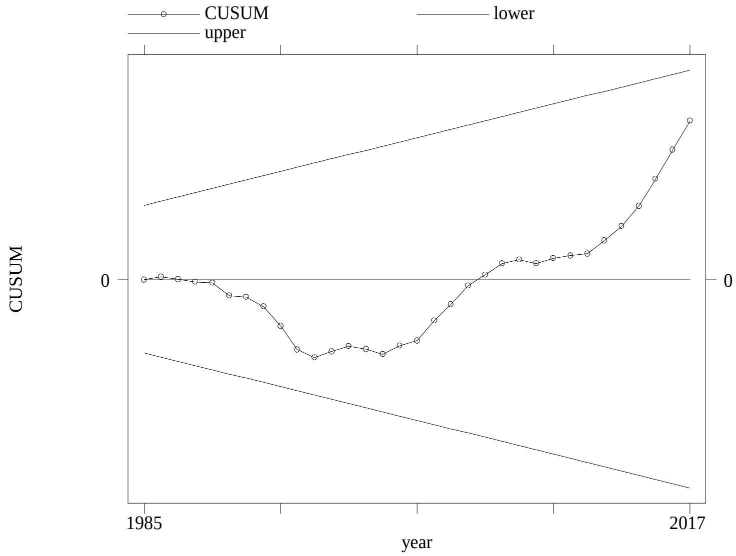
APPENDICES

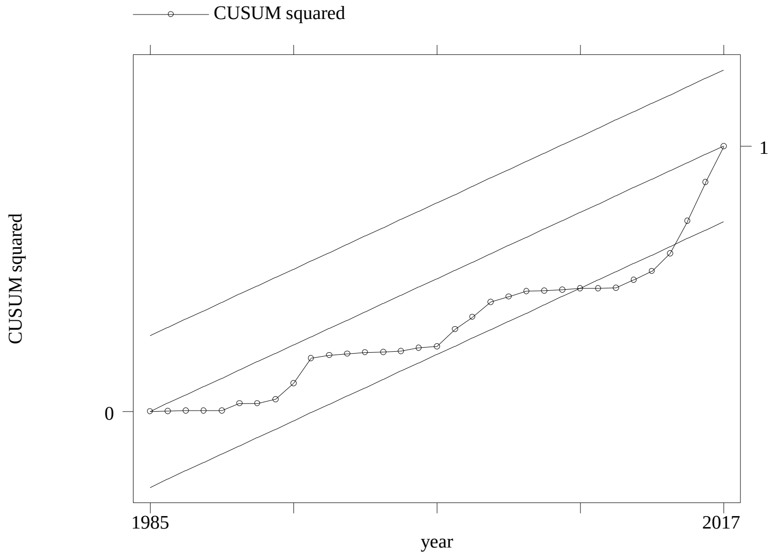
Appendix 1. ARDL Model Diagnostics

Test	Model 1	Model 2	Model 3	Model 4
	lnY	LnY1	lnY	LnY1
x^2 Serial correlation	2.006 (0.158)	0.617 (0.548)	0.301 (0.743)	0.075 (0.928)
x^2 Hettest	0.000 (0.973)	0.910 (0.341)	0.040 (0.849)	1.460 (0.227)
x^2 White	36.000 (0.422)	36.000 (0.422)	36.000 (0.422)	35.660 (0.390)
x^2 Normal	0.918 (0.632)	65.150*** (0.000)	0.660 (0.719)	48.700*** (0.000)
x^2 Ramsey RESET	1360 (0.281)	0.340 (0.793)	0.440 (0.730)	0.320 (0.809)

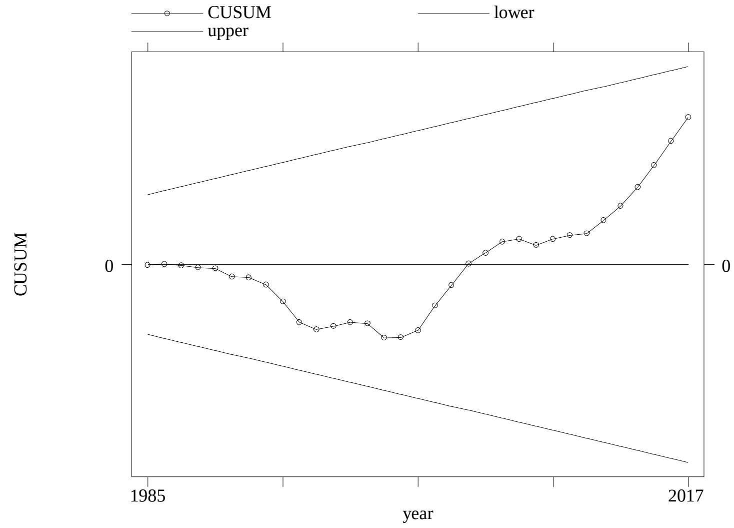
Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

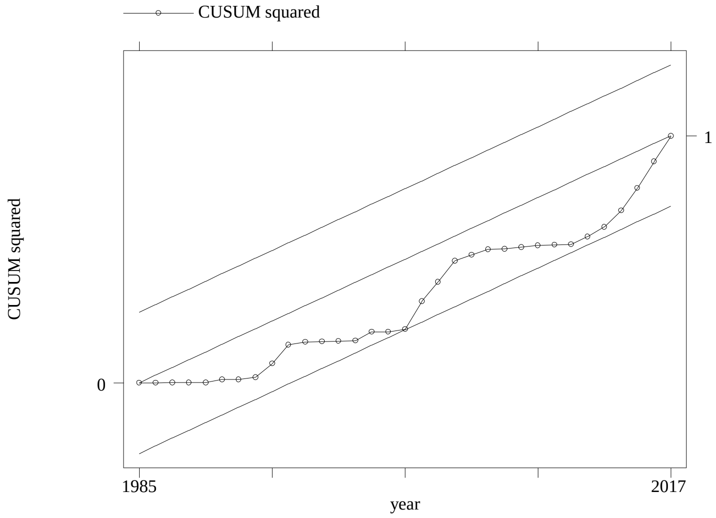
ARDL Model 1 Parameter Stability Test



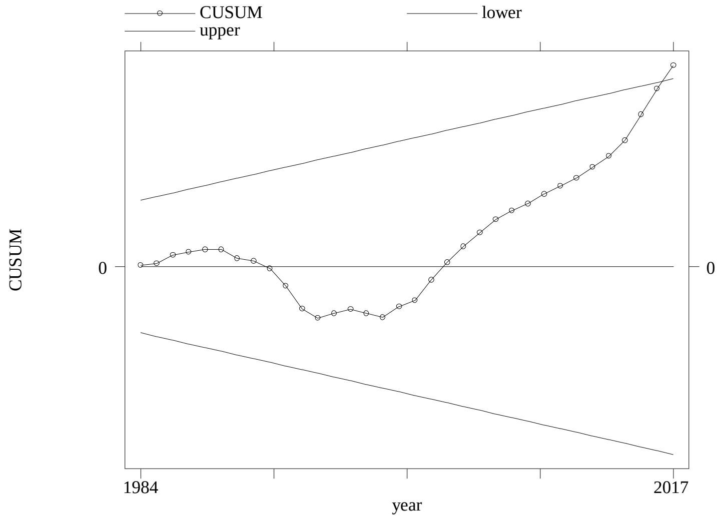


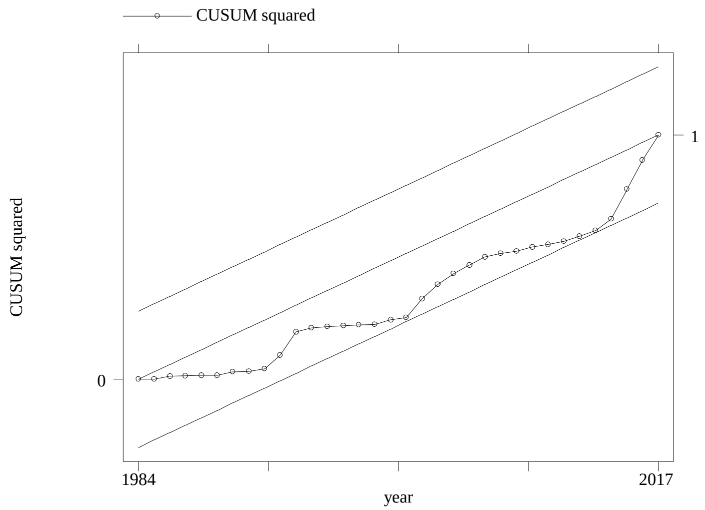
ARDL Model 2 Parameter Stability Test



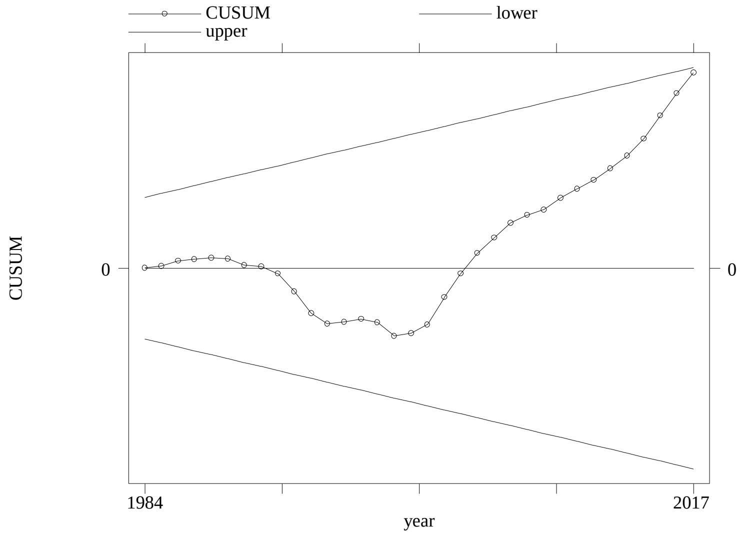


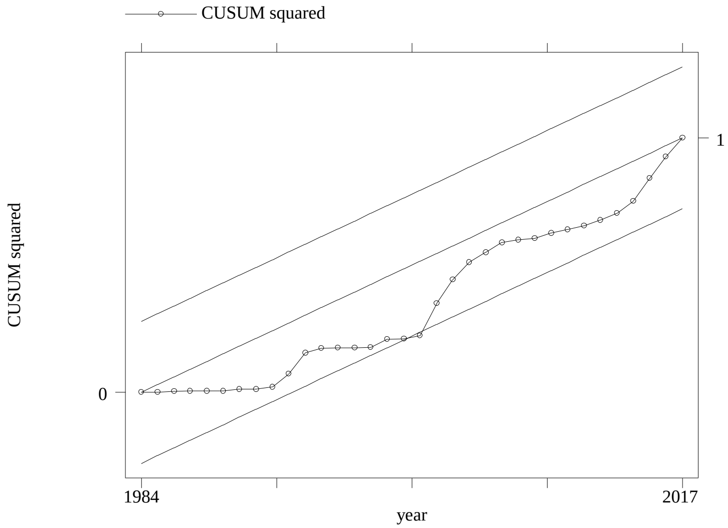
ARDL Model 4 Parameter Stability Test





ARDL Model 4 Parameter Stability Test





Apendix 2. Vector Error Correction Model (VECM) Results

VECM Model 1. Results

Dependent variables	lnY	lnxa	Lnxm2	lnXP
lnY	-0.008 (0.239)	-0.246 (0.520)	-0.915 (.829)	-0.121 (0.413)
LnY1				

lnXA	0.059 (0.094)	0.034 (0.204)	0.500 (0.324)	-0.015 (0.162)
lnXM2	-0.107 (0.066)	188 (0.143)	-0.161 (0.227)	-0.006 (0.113)
lnXP	0.129 (0.174)	0.047 (0.378)	0.592 (0.602)	0.014 (0.300)
D2002	0.191*** (0.072)			
Constant	-0.003 (0.042)	-0.011 (0.092)	-0.073 (0.146)	0.058 (0.073)
ECT_{t-1}	-0.263*** (0.078)	0.279*** (0.169)	-0.161 (0.269)	-0.162 (0.134)

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

VECM Model 2. Results

Dependent variables	lnY1	lnXA	LnXM2	lnXP
LnY1	0.277* (0.148)	-0.029 (0.152)	-0.147 (0.273)	-0.003 (0.152)
lnXA	-0.034 (0.170)	0.121 (0.175)	0.471 (0.315)	0.003 (0.175)
lnXM2	0.228 (0.150)	-0.383** (0.154)	-0.506* (0.276)	0.072 (0.154)

lnXP	-0.252 (0.313)	0.847*** (0.321)	0.757 (0.578)	-0.052 (0.322)
D1992	-1.099** (0.424)			
Constant	-0.171 (0.134)	0.034 (0.137)	-0.289 (0.247)	0.103 (0.137)
ECT_{t-1}	-0.283*** (0.101)	0.300*** (0.104)	0.209 (0.187)	-0.013 (0.104)

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

VECM Model 3. Results

Dependent variables	lnY1	LnXAM	lnXP
lnY	0.031 (0.224)	-0.768 (0.555)	-0.127 (0.388)
lnXP	0.078 (0.159)	0.238 (0.395)	0.014 (0.276)
lnXAM	-0.103 (0.078)	0.172 (0.194)	-0.039 (0.136)

D1992			
D2002	0.412*** (0.099)		
Constant	-0.008 (0.040)	-0.056 (0.100)	0.050 (0.070)
ECT_{t-1}	-0.323 (0.081)	-0.196 (0.201)	-0.273** (0.140)

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

Appendix 3. Vector Error Correction Models Diagnostics

Diagnostics Test	Model 1	Model 2	Model 3
R-Squared	0.492 (0.324)	0.416*** (0.004)	0.529*** (0.000)
x^2 LM test autocorrelation	6.799 (0.977)	6.924 (0.975)	2.846 (0.970)

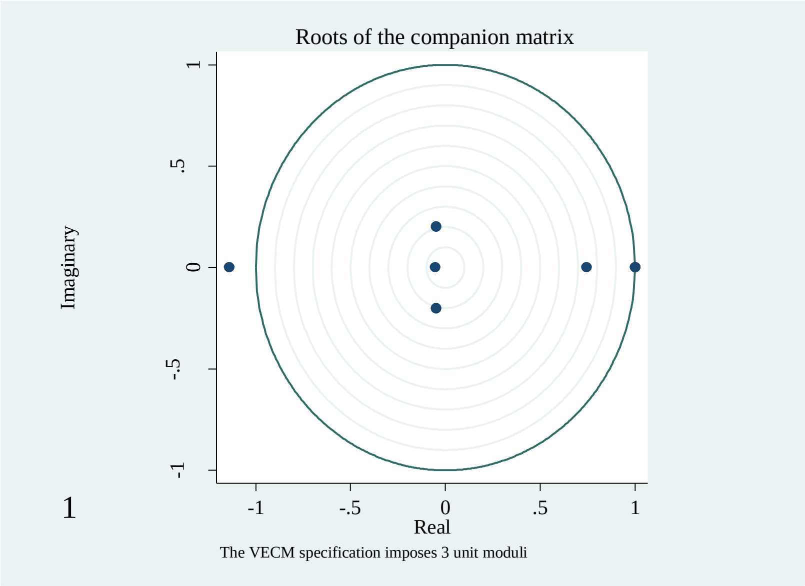
x^2 Normal	1.277 (0.528)	15.292*** (0.000)	(0.812) (0.666)

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.

Appendix 2. VAR Model 4 Diagnostics

Diagnostics Test	Model 1
R-Squared	0.954*** (0.000)
x^2 LM test autocorrelation	5.371 (0.800)
x^2 Normal	20.972*** (0.000)

Note: *, **, *** represent statistical significance at the 10%, 5% and 1% levels. Standard errors are presented in parenthesis. lnY, lny1, lnXA, lnXP lnXM2, lnXAM denote natural logs of GDP, GDP net of exports, Agricultural, mineral, manufacturing, and non-mineral exports.



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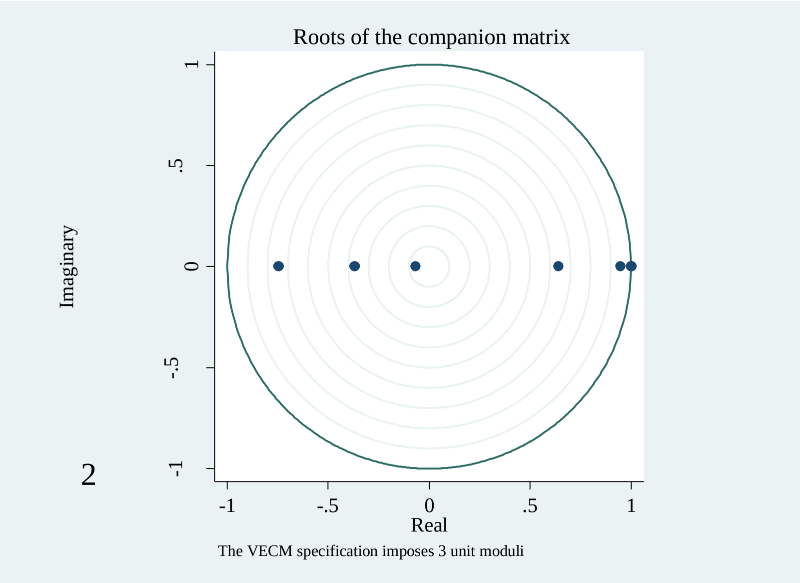

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Note: VECM model 1 and 2 graphs of eigenvalue in the unit circle

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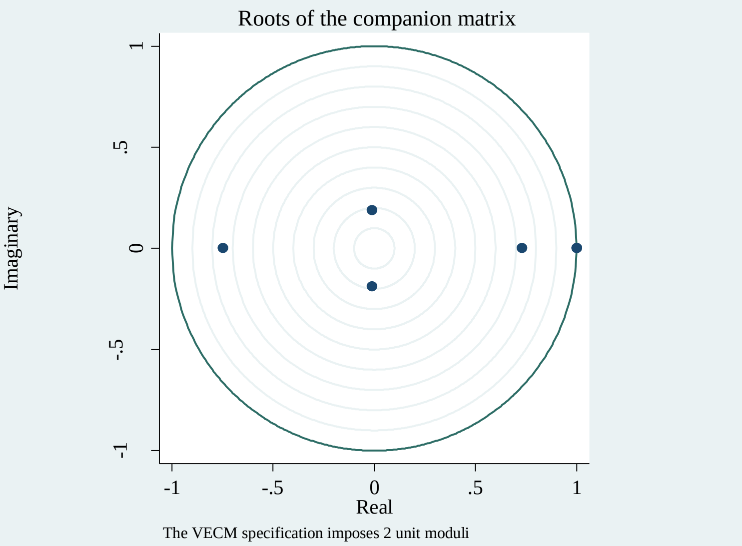

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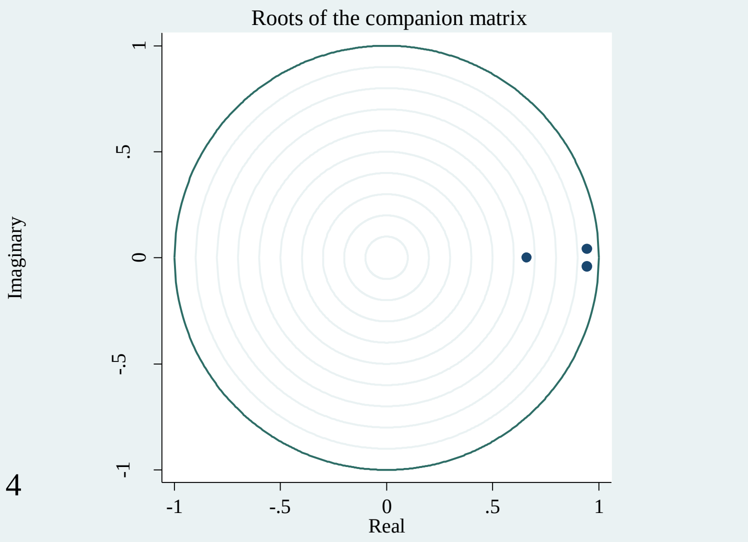

Note: VECM model 3 and VAR model 4 graphs of eigenvalue in the unit circle

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VITA

Titus Isaiah Zayone

Candidate for the Degree of

Master of Science

Thesis: EFFECTS OF AGRICULTURAL, MANUFACTURING, AND MINERAL EXPORTS ON THE ECONOMIC GROWTH OF ANGOLA

Major Field: International Studies

Biographical: Fulbright student in the School of Global Studies and Partnerships at Oklahoma State University, seeking a Master of Science Degree. Obtained a Bachelor of Arts Degree in 2013 from the University of Zambia,

Education:

Completed the requirements for the Master of Science in International Studies at Oklahoma State University, Stillwater, Oklahoma in May, 2019.

Completed the requirements for the Bachelor of Arts in Development Studies at the University of Zambia, Lusaka, Zambia in 2013.

Experience:

Logistics Assistant at Geocean Entrepores 2014-2015

Responsibilities: Local purchasing, tracking and clearing imports, and making travel reservations for expatriates in Angola.

Project Assistant at Universal Safety Solutions 2010-2013

Responsibilities: Collecting and entering road traffic surveys data, and liaising with clients on data related queries.

Professional Memberships:

International Studies Association 2019-presnet

Phi Beta Delta 2018-present