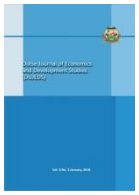
DUTSE JOURNAL OF ECONOMICS AND DEVELOPMENT STUDIES (DUJEDS)
DEPARTMENT OF ECONOMICS AND DEVELOPMENT STUDIES
FEDERAL UNIVERSITY DUTSE
E-Mail: dujeds@fud.edu.ng



AN ANALYSIS OF TRADE OPENNESS, MACROECONOMIC DYNAMICS AND ECONOMIC GROWTH OF OPEC COUNTRIES (1990-2018)

ALI Salisu — **Department of Economics, Bayero University Kano, Kano State, Nigeria**

ADAMU Aisha Hassan — **Department of Economics, Gombe State University, Gombe State, Nigeria**

Abstract

The study empirically tests whether openness leads to economic growth in Organization of Petroleum Exporting Countries (OPEC) countries and if trade openness induces macroeconomic dynamics. The study made use of annual panel data series dating from 1990 – 2018 sourced from United Nation Conference on Trade and Development (UNCTAD) and World Bank Development Indicator (WDI) data base. The study revealed that openness has a significant negative impact on economic growth in OPEC countries. The study further revealed that trade openness shocks can induce macroeconomic dynamics in OPEC countries. The study employed Panel Vector Autoregression (PVAR) technique to examine the transmission of trade shocks and macroeconomic dynamics in OPEC countries. While, the Dumitrescu-Hurlin (2012) Granger causality test was employed to examine the causal relationship between selected macroeconomic variables. The study sampled ten (10) OPEC countries base on the availability of data and seven macroeconomic variables were selected based on theory and empirical literature. The study therefore recommends that, trade openness must be accompanied by complementary policies aimed at encouraging the financing of new investment towards enhancing accumulation of capital and trade policies that ability to improve labour skills. These policies would then allow resources to be reallocated away from less productive activities and toward more promising ones. Policies that encourage exports and diversification, and that reduce barriers to openness, can boost economic performance.

Keywords: Trade Openness, Macroeconomic Dynamics, Economic Growth, PVAR

Introduction

According to World Trade Organization (2017), trade has continued to support economic growth and development, helping to reduce poverty around the world. Statistics from World Trade Organization (2017) indicates that world merchandise exports have increased in value by about 32 per cent since 2006, reaching $ 16 trillion in 2016. At the same time, world exports of commercial services have accelerated by about 64 per cent, reaching a total of $ 4.77 trillion (WTO, 2017). However, the Dwindling world trade growth is both a contributing factor and a symptom of the global economic slowdown since global trade growth has been volatile over the past four decades, (WTO, 2017).

To achieve a stable macroeconomic environment and achieve growth, OPEC member countries implement several trade policies such as trade restrictive measures which include the establishment of import or export tariffs or increases in these tariffs. The average tariff in Algeria is 18.7%, high rates at a level of 30% are applied to food, beverages, tobacco and consumers goods (WTO, 2017). Algeria has applied three levels of basic tariff since 2002 which include; 5% rate on raw materials, 15% on semi-finished products and 30% rate on finished products. In 2008, Angola eliminated tariffs on import of raw materials, equipment and intermediate goods for industries. The Angola Government established a tax import of luxury products, which are now subject to a one percent

surcharge (WTO, 2016). Ecuador's import policies are increasingly restrictive and results to an uncertain environment for traders in many sectors (WTO, 2015). Since 2011, Ecuador has pursued a strategic policy of import substitution (WTO, 2016). According to the WTO trade policy review (TPR), Ecuador's tariff structure has been more complex. Ecuador generally apply a simple four-tiered tariff structure with levels of 5% for most raw materials and capital goods, 10% or 5% for intermediate goods, and 20% for most consumer goods (WTO 2013). The products subject to selective import substitution measures include; fertilizers, agrichemicals, pesticides and fungicides, soaps, detergents and cosmetics, other chemicals, ceramic tiles and floors, textiles, clothing, footwear, leather, radios, television, telephones, electronics, and electrical appliances (WTO, 2016). As a member of the Gulf Cooperation Council (GCC), Kuwait started applying the GCC common external tariff since 2003 (WTO, 2011). As a result, the simple average tariff declined from 7.7% in 2002 to 4.8% in 2011. According to WTO (2017), Kuwait tariffs averages 5.7% on agricultural products and 4.6% on non-agricultural products; 98.6% of all tariff lines are ad valorem, with 19 mixed tariff lines on tobacco and tobacco products. Kuwait bound all tariff lines, except on oil, petroleum, and petrochemicals (WTO, 2017). The tariff rate in Saudi Arabia averages 5%. Saudi Arabia applies free trade policy to general products, placing no quantitative or price controls on imports (WTO, 2011).

The recent slump in global crude oil prices in 2014 had pushed majority of OPEC countries into recession. This is due to the fact that, foreign earnings had dropped and subsequently leading to the depreciation of their currencies to other foreign currencies. Since these countries are import dependent, the depreciation of the currencies to foreign currencies saw that imports became very expensive as a result lead to persistent hyperinflation and other economic instability within the OPEC economy. By mid-2014 for instance the Algerian dinar depreciated 27% against the US dollar by the end 2015 of (World Bank 2015). The same situation with the naira, the naira exchanged to the dollar at $1 to N400 within the same period. Unlike Algeria, the Nigerian currency continued to drop all through to the end of 2016 before it began to stabilize (CBN, 2017). The situation in Angola wasn't different either has the Kwanza depreciated by 22% against the US dollar, the currency was devalued by 11% in 2017 against the US dollar in 2017 (IMF, 2018)

Within the same period, inflation had been on the rise in most of these OPEC economies. For instance, Nigeria's consumer prices increased to 16.25% in May 2017, easing from a 17.24% in early 2017 after reaching an all-time high of 18.30% in 2016 (CBN, 2017). In Venezuela inflation has soared above +1000% in 2016the highest rates in the world (World Bank, 2017). In Iran the services price index increased by 11.5% between the years 2014 to 2015 and slightly fell down 11% in October 2016 (World Bank, 2017). Furthermore, still on Iran, the annual price of commodities increased to about 17.1% and 11.2% between the year 2016 to 2017 respectively (World Bank, 2017). The Consumer price index (CPI) increased to 2.9% within the period of economic crisis in Kuwait (QNB, 2017). In Angola, inflation fell to an annual average of 30.4% in 2018 from 32.4% in 2017 easing from 37.2% in 2016 (IMF, 2018). The annual average CPI in Ecuador stood at 0.29% in 2018 easing from 0.42% from the previous year, while inflation in Algeria fell from an average of 6.4% in 2016 to 5.5% in 2017. However, inflation rose to 7.5% in 2018 (IMF, 2018).

The objective of this paper is to analyzed trade openness, macroeconomic dynamics and economic growth of the sampled ten (10) OPEC countries (1990-2018). In achieving this objective, the study is divided into five parts. This is an introduction, followed by literature review as the second part. The third part is methodology and the fourth part is result and analysis, while the last part is conclusion and policy implication.

Literature Review

Trade Openness

For a long time, economists have attempted to find comparative measures of trade openness but this has proven to be controversial and difficult. As Winters (2004) posited, the definition and measure the degree of trade openness of an economy is indeed a tough task and is a common problem associated with most studies (Winters, 2004). According to Alcala and Ciccone (2003), trade openness can be measured in different ways. It is difficult to construct a universally acceptable measure of trade openness. Various contending measures of openness such as trade intensity, tariff and non-tariff barriers, the indices constructed by Dollar (1992) and Sachs and Warner (1995) are available to potential researchers.

Macroeconomic Dynamic

Macroeconomic dynamic is usually understood as a situation of economic malaise where the economy does not seem to have settled in a steady position and where, eventually, something needs to be done for putting it back on track (Azam, 2001).

According to Joya (2011), the concept of "macroeconomic dynamic (instability)" is not necessarily associated with economic crises. Although volatility usually appears during the periods of crisis in developed countries, it is an endemic phenomenon in developing countries and

must not be confined to instances of crisis (Malik & Temple, 2009 cited in Joya, 2011).

Theoretical Literature Review

Trade Theory

The concepts of trade openness and economic growth embedded in microeconomics and macroeconomics respectively. Trade openness can be traced back to mercantilism, the classical economists and Heckscher-Ohlin trade theories. The mercantilists viewed economic activity as a zero-sum game in which one country's economic gain was at the expense of another. The mercantilists stressed the need to maintain an excess of exports over imports (Hassan 2007).

Other trade theories include; Adam smith theory of trade (Absolute advantage trade theory), David Ricardo comparative Advantage theory, Theory of Customs Unions and Free Trade Area, and Hecksher-Ohlin trade theory. This study would build its argument under theoretical framework of Hecksher-Ohlin trade theory because it is widely used as the theoretical framework for analysis by scholars and it is one of the most recent among other trade theories.

Empirical Literature Review

Ghulam, Marian and David (2017) examined the tree-way relationship between Economic Growth, Human Development and Openness to Trade. They based their empirical analysis on the Cobb-Douglass Production Theory. They employed Pooled OLS, 2 stage Least Square and 3 Stage least Square to estimate the relationship between Trade Openness, FDI, and Market Size among 12 developing ASIAN Countries from 1970-2011 (42 years). The countries are Bangladesh, India, Nepal, Pakistan, Sri Lanka, Indonesia, Malaysia, Philippines, Singapore, South Korea, Thailand, and China. The three sets of results were comparable; less comparable but still qualitatively similar are the results from fixed effects estimations which are available from the authors. Their study concluded that Trade Liberalization policies lead to higher growth as well as higher human development.

Furthermore, Iyoha and Okim (2017), investigated the relationship between trade and economic growth in ECOWAS countries from 1990 to 2013, they made use of 15 ECOWAS countries to estimate the relationship between per capita real income, total exports (a proxy for trade), real gross domestic capital formation, human capital, proxied by number years in school, growth rate of population, nominal exchange rate and inflation rate. They reported that all the 4 estimated regression equations had high coefficients of determination and F-statistic. In all the equations, exports, exchange rate and investment were significant determinants of per capita real income growth. Exports were consistently positively related to growth, thus confirming the hypothesis of trade having a significant positive impact on economic growth in ECOWAS countries. The study concluded that there is positive long run relationship between trade openness and economic growth in ECOWAS countries.

Jamilah, Zulkornain and Muzarar (2016), investigated the relationship between openness and economic growth in 87 selected countries which includes Organization of Economic Co-operation and Development Countries (OECD) from 1977 to 2011, using GMM estimation, they examine the relationship between GDP per capita, Trade Openness. The results indicated that Openness yields a significant positive impact on economic growth. And Bidirectional causality between openness and economic growth was found.

In addition, Marjan and Karim (2016), examined the relationship between trade openness, economic growth, financial development and quality of environment in OPEC member countries from 1990-2010. They used simultaneous equations and GMM estimation to examine the relationship between Carbon Dioxide Emission, Trade Openness, Squared GDP, Financial Development, GDP, Capital, Foreign Direct Investment, Inflation and Energy UR in percentage of Urban Population. They concluded that there is a bidirectional relationship between variables.

Also, Karman, Haider, Mushtaq, Mustafa and Bano (2016), examined the realistic relationship between trade openness and economic growth of 20 different countries (no justification for selecting these countries was given by the authors). The study employed fixed effects and random effects to explore the relationship between GDP, Trade Share, Import penetration ratio and export penetration ratio. The study concluded that there is lack of statistically robust association between trade openness and long-run growth.

Rubert and Mahabir (2015), empirically examined the relationship of growth destination through trade in African Countries. They employed the Generalized Moment of Mean Method (GMM) and to Fixed Effect techniques to estimate the relationship between trade openness and GDP (Growth) in the equation it includes investment to GDP ratio, foreign direct investment to GDP ratio, and Aid to GDP ratio. The results indicated that trade openness does not support growth, Africa-US trade has no statistically significant impacts and the results are robust across numerous specifications and persist even after carefully accounting for endogeneity between trade and growth.

Cakir and Kabundi (2013), studied the trade linkages between South Africa and the BRIC

(Brazil, Russia, India and China) countries. The study applied a global vector autoregressive model (GVAR) to investigate the degree of trade linkages and shock transmission between South Africa and the BRIC countries over the period 1995Q1–2009Q4. The results suggest that trade linkages exist between these economies; however, the magnitude differs between countries. Shocks from each BRIC country are shown to have considerable impact on South African real imports and output.

Methodology

The variables that was used in this paper was an annual data series that was sourced from the United Nation Conference on Trade and Development (UNCTAD) website data base, World Bank Development Indicator (WDI) website Data base, U.S Energy Information Administration (EIA) Website, and International Monetary Funds (IMF) website data base. seven (7) variables namely; Gross Domestic Product per capita (GDPc), Total Labour Force (LBF), Capital Stock per unit of labour {Gross capital formation as capital stock (CPT)}, Trade openness {degree of openness (TO)},Consumer Price Index (CPI), Exchange Rates (EX), and Annual Crude Oil Production (COP) covering the period of 1990 to 2018 was used. 10 OPEC countries were sampled for the study and they include Algeria, Angola, Ecuador, Gabon, Islamic Republic of Iran, Kuwait, Libya, Nigeria, Saudi Arabia, and Venezuela.

Model Specification

In achieving the objectives of this study especially its first and second specific objectives, the study used an augmented Cobb-Douglas production function framework as suggested by Balanika (2013) and Marjan and Karim (2016). However, the model used in this study followed the work of Balanika (2013) who investigated the relationship between trade openness and economic growth using a sample of 71 developing countries over the period 1990-2005. The model was specified as:

$$GDPc_{it} = \beta_0 + \beta_1 POP_{it} + \beta_2 INV_{it} + \beta_3 TO_{it} + \beta_4 DCR_{it} + \beta_5 IND_{it} + \beta_6 INFL_{it} + \beta_7 GDPc_{it-1} + u_{it} \quad (1)$$

Where; $GDPc_{it}$ is gdp per capita, POP_{it} is population growth, INV_{it} Investment level, TO_{it} trade openness, DCR_{it}, is Domestic Credit, IND_{it} is industry share to GDP, $INFL_{it}$ is inflation and $GDPc_{it-1}$ is the lagged value of gdp per capita.

Hence, the empirical specification can be specified as follows;

$$GDPc_{it} = \beta_0 + \beta_1 TO_{it} + \beta_2 EX_{it} + \beta_3 COP_{it} + \beta_4 LBF_{it} + \beta_5 CPT_{it} + \varepsilon_{i,t} \quad (2)$$

Where, $GDPc_{it}$ is Gross Domestic Product (GDP) per capita, LBF is Labour force growth, CPT is capital stock per unit of labour (Gross capital formation as capital stock), TO is trade openness (degree of openness), EX is Exchange Rates and COP is Crude oil production, However, i and t denote number of cross sections and time, respectively, ε_{it} is the error term and β represents the estimated coefficients of all independent variables.

Techniques of Data Analysis

Panel Vector Autoregressive Model (PVAR)

To achieve the objective of this paper Panel VAR model was. The Vector Autoregressive (VAR) models are powerful tool to analyze the dynamic behavior of endogenous and interdependent macroeconomic variables (Lennman, 2016).

Panel VAR (PVAR) Model

The PVAR approach on a system of linear equations based on a panel VAR of lag order p as specify below;

$$y_{it} = A_1 y_{it-1} + A_2 y_{it-2} + \ldots\ldots + A_{p-1} y_{it-p+1} + A_p y_{it-p} + \beta x_{it} + c_i + \mathcal{E}_{i,t} \quad (3)$$

The dynamic form presented by Lennman (2016) is as follow

$$y_{it} = \rho y_{i,t-1} + \beta x_{it} + c_i + \mathcal{E}_{i,t} \quad (4)$$

When considering multiplier dependent variables, the dynamic model is transformed into the panel VAR model of lag order p with k variables. The study exemplify this in (3.12) which is a panel VAR model representation just like (3.11) but in matrix form, with k variables but only 1 lag length. Presenting the matrix form with longer lag lengths is space-consuming and redundant it basically just adds extra rho matrixes and a y_{t-p} matrix.

$$\begin{pmatrix} y_{1,t} \\ y_{2,t} \\ \vdots \\ y_{k,t} \end{pmatrix} = \begin{bmatrix} \rho_{11} & \rho_{12}\cdots & \rho_{1k} \\ \rho_{21} & \rho_{22}\cdots & \rho_{2k} \\ \vdots & \vdots \ddots & \vdots \\ \rho_{k1} & \rho_{k2}\cdots & \rho_{kk} \end{bmatrix} \begin{pmatrix} y_{1,t-1} \\ y_{2,t-1} \\ \vdots \\ y_{k,t-1} \end{pmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12}\cdots & \beta_{1k} \\ \beta_{21} & \beta_{22}\cdots & \beta_{2k} \\ \vdots & \vdots \ddots & \vdots \\ \beta_{k1} & \beta_{k2}\cdots & \beta_{kk} \end{bmatrix} (x_{1,t}, x_{2,t}, \dots, x_{j,t}) + \begin{pmatrix} c_i \\ c_i \\ \vdots \\ c_i \end{pmatrix} + \begin{pmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \vdots \\ \varepsilon_{k,t} \end{pmatrix} (5)$$

In (5) we have a vector of dependent variables on the left-hand side, which are also included with a lag on the right-hand side. x_{it} is a column vector of the exogenous variables, c_i and ε_{it} are the panel fixed effects and the error term respectively. Which is simply a way to present a panel VAR model in matrix form where there are a different number of lags on the dependent variable list and a list of exogenous variables?

This study made use of Abrigo and Love (2015) panel VAR technique to examine the shocks transmission among variables. Analysis is based on a panel data vector autoregressive (panel VAR) model of Love and Zicchino (2006). The method combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel data approach, which allows for unobserved individual heterogeneity. This technique was improved by Abrigo and Love (2015)

Abrigo and Love (2015) described the following *k*-variate panel VAR of order *p*, with panel specific fixed effects represented by the following system of linear equations:

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + \dots + Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + X_{it}B + U_{it} + e_{it} \quad (6)$$

$i \in \{1,2,\dots N\}$, $t \in \{1,2\dots T_i\}$

Where Y_{it} is a (l*xK*) vector of dependent variables; X_{it} is a (*lxl*) vector of exogenous covariates; u_{it} and e_{it} are (*lxk*) vectors of dependent variable-specific fixed-effects and idiosyncratic errors. The (*kxk*) matrices $A_{1,2},\dots,A_{p-1},A_p$ and the (*lxk*) matrix *B* are parameters to be estimated.

Impulse Response Functions

An impulse response function (IRF) is simply an illustrative procedure as to show how a stable model in equilibrium reacts to an innovated shock to any of the included regressors (Lennman, 2016).

Panel Causality Test

To specify the causal direction of the transmission mechanism between imbalances, we rely on the panel non-causality test developed by Dumitrescu-Hurlin (2012).

Lag Selection Criteria

Table 1: Order of Lag Selection Criteria

Lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	.9959125	44.63637	.6114692	-218.4343	-51.36363	-118.6809
2	.9992821*	30.59728*	.5375281*	-144.7832	-33.40272	-78.28091
3	.9986075	28.1343	.0304712	-59.55592	-3.865695	-26.30479

Source: Computed by the researcher using STATA 14 (2018).

In order to estimate the PVAR framework, it is necessary to examine the optimal lag in the model selection. The second phase was to estimate the optimal moment and model selection, according to Andrews and Lu (2001). The output of the test is very similar to the one built on likelihood-based criteria (AIC, BIC and HQIC values): the preferred model is the one with the lowest values. Their model selection criterion is based on Hansen's (1982) J statistic of over-identifying restrictions. The results of the tests are presented in Table 4.13

Impulse Response Function

To examine the response of one variable in a system to another variable, the impulse response function is applied to examine the response of shocks transmission from one variable to another variable.

Table 2: PVAR Impulse Response

Response to	Response of LOGGDPc	TO	EX	LOGCPI
LOGGDPc	0.610***	-0.115***	-0.012***	0.031***
	(0.061)	(0.0145)	(0.003)	(0.004)
TO	0.065	0.948***	0.032***	-0.022***
	(0.124)	(0.042)	(0.005)	(0.007)
EX	-0.880*	0.038	0.679***	0.216***
	(0.532)	(.212)	(0.0678)	(0.044)
LOGCPI	2.238***	0.580***	0.062***	0.756***
	(0.584)	(0.107)	(0.021)	(0.054)

Source: Computed by the researcher using STATA 14 (2018). The asterisks ***, ** and * indicate significance at 1%, 5% and 10% respectively. The figures in parenthesis () are standard errors.

As seen the table above the response to shocks of LOGGDPc to its own shocks was significant. However, the response of LOGGDPc to shocks from trade openness is negative and statistically significant 5% as seen from the chart we can see curve sloped slightly downward by the first horizon. This indicate that trade shocks has negatively affect the economy in OPEC countries. This implies that trade shocks have slow down OPEC economy from the 1st period to the 10th period. Likewise, the response of TO to shocks from LOGGDPc is positive and statistically insignificant at 5%. This finding suggests that trade openness although slightly being supported by economic growth, but the long adverse effect will slow down the economy for 10 periods. This further indicates that trade shocks account for about 11.5% fluctuation in the economy. This is consistent to the findings of Kose and Riezman (2000) who examined the role of external shocks in explaining macroeconomic fluctuations in African countries. They examine the cyclical behavior of trade shocks and their movement with aggregate output and the trade balance using annual data of twenty-two non-oil exporting African countries. Their study indicates that while trade shocks account for roughly 45 percent of economic fluctuations in aggregate output. Their study also finds that adverse trade shocks induce prolonged recessions. This could be seen recently when majority of OPEC countries fell in to recession.

Further analysis showed that the response of EX to shocks from LOGGDPc is negative and statistically significant at 5% as seen from the chart we can see curve sloped slightly downward from the last horizon. Ironically, LOGCPI response positively to shocks from LOGGDPc, statistically significant at 10%, as seen from the chart we can see curve sloped slightly upward from the first horizon to the fifth horizon.

In addition, the response of EX to shocks from trade openness is positive and statistically insignificant at 5% as seen from the chart, we can see the curve sloped slightly upward from the first horizon to the fifth horizon. But trade shocks response to exchange rates shocks was negative in the 10th period. Likewise, the response of LOGCPI to shocks from trade openness is negative and statistically insignificant at 5% as seen from the chart we can see curve sloped slightly downward from the first horizon to the fifth horizon.

Also, the response of LOGGDPc to shocks from EX is positive from the 1st to the 5th period, however it became negative and statistically significant at 5% from the 6th period to the 10th period. The response of trade openness to shocks from LOGCPI and statistically significant at 5% is negative from the 2nd period to the 10th period. In addition, the response of EX to shocks from LOGCPI is positive and statistically insignificant at 5% as seen from the chart. We can see the curve sloped slightly upward from the first horizon to the fifth horizon. Likewise, the response of LOGCPI to shocks to own shocks is positive and statistically insignificant at 5% as seen from the chart we can see curve sloped slightly upward from the first horizon to the fifth horizon.

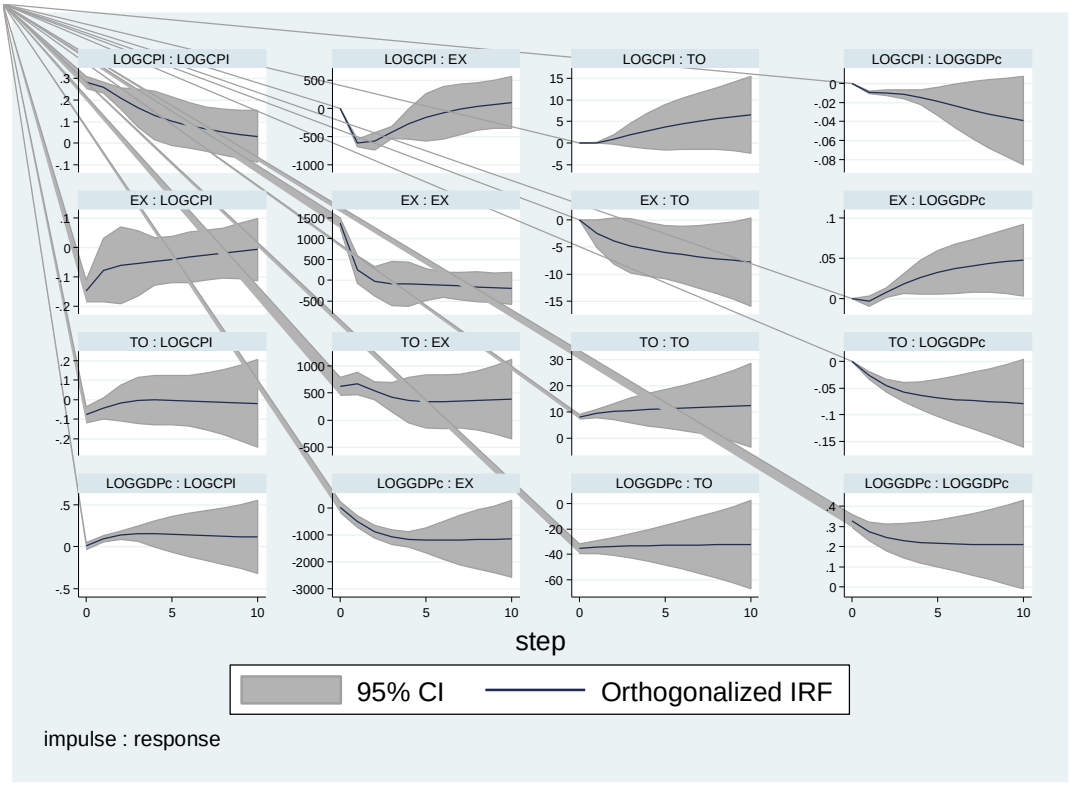


Fig. 1.: PVAR Impulse Response Graphs
Source: Generated by the Author using STATA 14 (2018)

Forecast-Error Variance Decomposition

The essence of using forecast variance decomposition technique is to measure the fraction of forecast error variance for each of the variables under investigation to its shocks and also to shocks of other variables. The table 4.15 below is the results of the PVAR forecast variance decomposition with both the direct and indirect effects of the shocks

Table 3: PVAR Forecast-Error Variance Decomposition

Response to	Response of LOGGDPc	TO	EX	LOGCPI
LOGGDPc	5038754	.2662888	.0508888	.1789469
TO	.0422969	.8544728	.0921548	.0110756
EX	.0209559	.0895766	.7589799	.1304875
LOGCPI	.3109341	.025404	.0163886	.6472734

Source: Computed by the researcher using STATA 14 (2018)

The variance decompositions shows the percent of the variation in one variable that is explained by the shock to another variable, accumulated over time. The variance decomposition is an indication of the magnitude of the total effect from the tenth period of observation. From the table above, TO explain a total of 26.6% variation in LOGGDPc while, EX explain a total of 5.1% variation in LOGGDPc, likewise, LOGCPI explains a total of 17.9% variation in LOGGDPc in the tenth period.

Furthermore, LOGGDPc explain a total of 4.2% variation in TO while, EX explain a total of 9.2% variation in TO, likewise, LOGCPI explains a total of 11% variation in TO. Likewise, LOGGDPc explain a total of 2.1% variation in EX while, TO explain a total of 8.9% variation in EX, likewise, LOGCPI explains a total of 13% variation in EX. In addition, LOGGDPc explain a total of 31.1% variation in LOGCPI while, TO explain a total of 2.5% variation in LOGCPI, likewise, EX explains a total of 1.6% variation in LOGCPI in the tenth period.

PVAR Diagnostics Test (PVAR Stability Test)

The PVAR stability test is necessary to see if the PVAR model is stable. A stable PVAR model is appropriate for estimation and analysis. If the PVAR framework is not stable one is required to jettison the model and formulate another model. The figure 4.3 below shows the PVAR model which is reported in a graphical form of the eigenvalues.

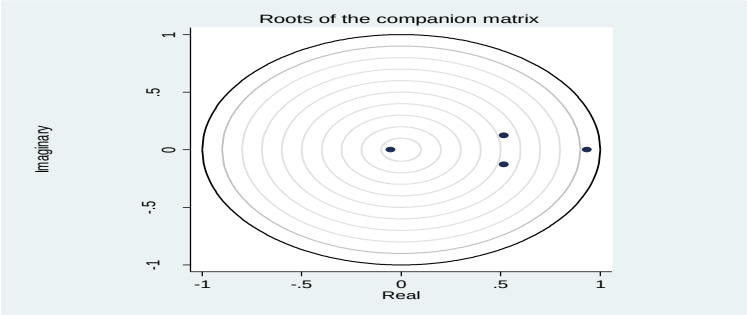


Fig. 2: PVAR Stability Graph
Source: Generated by the Author using STATA 14 (2018)

It is required that all points are in the modulus, this means the impacts of the shocks are callable and finite. From our model we can see all the points are within the modulus; this means our PVAR model is stable and good for analysis. To corroborate this fact from the AR table we can see all medullae are all less than one (1) hence it justifies our AR graph that our VAR model is good for analysis and we can use it.

Serial Correlation Test

It is necessary to test for the presence of autocorrelation in the model. This is because if a model has autocorrelation, the model is not good for analysis and policy prescription. This study made use of Wooldridge test for autocorrelation in panel data. The test follows the null hypothesis of no first-order autocorrelation.

Table 4: Wooldridge Test for Autocorrelation in Panel Data

F(1, 9)	0.051
Prob > F	0.8258

Source: Computed by the researcher using STATA 14 (2018).

From the table above, given the F-statistics of 1.565 and a probability value of 0.2425, this signifies the acceptance of the null hypothesis at 5% level of significance. This implies that the model does not suffer from serial correlation.

Table 5: PVAR Granger Causality Analysis

The Null Hypothesis	$Z_{bar\ stat}$	Decision
H0:TO does not Granger-cause LOGGDPc	3.8480***	Rejected
H0: LOGGDPc does not Granger-cause TO	2.9889**	Rejected
H0: LOGCPI does not Granger-cause LOGGDPc	8.2669***	Rejected
H0: LOGGDPc does not Granger-cause LOGCPI.	0.4598	Accepted
H0: LOGGDPc does not Granger-cause EX	5.1536***	Rejected
H0: EX does not Granger-cause LOGGDPc	4.2613***	Rejected
H0: EX does not Granger-cause TO	-1.1345	Accepted
H0: TO does not Granger-cause EX	7.3346***	Rejected
H0: LOGCPI does not Granger-cause TO	0.8474	Accepted
H0: TO does not Granger-cause LOGCPI	3.6049***	Rejected
H0: EX does not Granger-cause LOGCPI	8.8307***	Rejected
H0: LOGCPI does not Granger-cause EX	4.2609***	Rejected

Source: Computed by the researcher using STATA 14 (2018). The asterisks ***, ** and * indicate significance at 1%, 5% and 10% respectively. The figures in parenthesis () are standard errors

The results of Dumitrescu and Hurlin (2012) Granger causality test in the table 4.18 above suggest that it is possible to reject the null hypothesis that TO does not homogenously cause LOGGDPc and the same as LOGGDPc does not homogenously cause TO. The presence of bidirectional causality between TO and LOGGDPc lends support for the feedback hypothesis whereby TO and LOGDPc are interdependent. This interdependency suggests that trade openness leads to increase in economic growth and economic growth will have influence on trade openness. Thus, TO has a strong influence on LOGGDPc and visa-visa. This result is consistent with, Rudra, et al (2017), Nowbutsing (2014), Mercan, Gocer, Bulut, and Dam (2013),and Gries and Redlin (2012) who found out that there is a bidirectional relationship between trade openness and economic growth. However, the finding is inconsistent with the findings of Kojo, Saban and Yemane (2014) who revealed that there is no causal relationship between trade openness and economic growth.

As regards to the causal relationship between LOGCPI and LOGGDPc, it is not possible to reject the null hypothesis that LOGCPI does not homogenously cause LOGGDPc, but accept the null

in the opposite direction. This means that there is an evidence of uni-directional causality running from consumer price index to economic growth, meaning that any changes in LOGCPI will affect LOGGDPc. In other words, at 5% level of significance, LOGCPI could be considered as a significant factor in promoting economic growth. This suggests that an increase in LOGCPI could cause an expansion to economic growth. This result is consistent with the findings of Pam (2016),

The panel causality results also suggest that it is possible to reject the null hypothesis that EX does not homogenously cause LOGGDPc and the same as LOGGDPc does not homogenously cause EX. The presence of bidirectional causality between EX and LOGGDPc lends support for the feedback hypothesis whereby EX and LOGDPc are interdependent. This interdependency suggests that exchange rates leads to increase in economic growth and economic growth will have influence on exchange rates. Thus, exchange rates have a strong influence on LOGGDPc and visa-visa. This result is consistent with respect to the findings of Blagrave and Vesperoni (2018), Ali and Anwar (2017) and Kose and Riezman (2000).

With respect to the causal relationship between EX and TO, it is not possible to reject the null hypothesis that EX does not homogenously cause TO, but reject the null in the opposite direction. This means that there is an evidence of uni-directional causality running from trade openness to exchange rates, meaning that any changes in TO will affect EX. In other words, at 5% level of significance, TO could be considered as a significant factor influencing exchange rates. However, exchange rates have negative but insignificant influence on TO, which suggest that exchange rates had not been favorable to trade in OPEC countries. This suggests that an increase in LOGCPI could cause an expansion to economic growth. This result is consistent with respect to the findings of Blagrave and Vesperoni (2018), and Ali & Anwar (2017).

The findings also indicated by the causal relationship test between LOGCPI and TO, it is not possible to reject the null hypothesis that LOGCPI does not homogenously cause TO, but reject the null in the opposite direction. This means that there is an evidence of uni-directional causality running from consumer price index to trade openness, meaning that any changes in LOGCPI will affect TO. In other words, at 5% level of significance, LOGCPI could be considered as a significant factor influencing TO. This suggests that an increase in LOGCPI could cause an expansion to economic growth. This result is consistent with respect to the findings of Blagrave and Vesperoni (2018), Ali & Anwar (2017) and Kose and Riezman (2000).

As suggest panel causality results, it is possible to reject the null hypothesis that EX does not homogenously cause LOGCPI and the same as LOGCPI does not homogenously cause EX. The presence of bi-directional causality between EX and LOGCPI lends support for the feedback hypothesis whereby EX and LOGCPI are interdependent. This interdependency suggests that exchange rates influence consumer price index and consumer price index have influence on exchange rates.

Conclusion and Recommendations

The paper proved that trade openness shocks has a significant adverse impact on economic growth. This shocks transmission from trade shocks as well as other macroeconomic variables is evidence that trade shocks has a significant relationship in causing macroeconomic dynamics in OPEC countries. The study further concluded that there is a causal relationship between trade openness and economic growth among other macroeconomic variables shows at lease a uni-directional relationship. This suggests that there is a causal relationship between these macroeconomic variables associated with economic growth and macroeconomic dynamics.

It can be recommended that policy makers in OPEC countries should implement trade policies that will be favourable for the economy. In addition, trade policies that will reduce the importation of consumable goods such as food items and encourage the export of refined product should be considered. Having observed that trade openness can cause economic dynamics among other macroeconomic variables, it is relevant for OPEC countries when formulating policies should consider the adverse effect of increase in openness of the economy. These will enable OPEC countries to control the rate at which trade openness shocks can induce fluctuation in their economy. Likewise, exchange rate shocks were found to contribute to macroeconomic dynamics in OPEC countries. Therefore, an exchange rate policy, which is favorable to export expansion and consistent with the status of these countries as small open economies, is recommended. The monetary policies makers in OPEC countries should come together and examine how to adopt exchange policies that will be line with crude oil export and other commodity trade to boost economic. Consumer price index proxy of inflation is found to have significant impact in causing macroeconomic dynamic in OPEC economy.

References

Acemoglu, D. and F. Zilibotti.(1997). "Was Prometheus Unbound by Chance? Risk, Diversification, and Growth."*Journal of Political Economy*. Vol. 105 (4): 709-751. cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Adolfo. S and Mário J.C.M (2015), Inflation and Trade Openness Revised: An Analysis Using Panel Data. Discussion Paper, Institute for Applied Economic Research – ipea2015, Brasília: Rio de Janeiro: ISSN 1415-4765, CDD 330.908, JEL: C23; E61

Agénor, P R. (2004)."The Economics of Adjustment and Growth."Second Edition. Harvard University Press, cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Aghion, P., P. Bacchetta, and A. Banerjee.(2004). "Financial Development and the Instability of Open Economies."*Journal of Monetary Economics*. Vol. 51 (6): 1077-1106.cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Ahmad Z.A.J, Mukaramah H and Siti H.C.M (2012), Macroeconomic Instability and Fiscal Decentralization: An Empirical Analysis, DOI: 10.18267/j.pep.416, JEL Classification: E31, H5 H6 H7

Aisen, A. and Veigaj F. J. (2006). Does Political Instability Lead to Higher inflation? A panel Data Analysis.*Journal of Money, Credit and Banking 38(5). Pp. 1379-1389*

Alcala, F., & Ciccone, A. (2003). Trade, Extent of the Market, And Economic Growth 1960-1996. Departament d'Economica i Empresa, UPF; 765 .

Ali, S.Z. and Anwar S. (2017), Anticipated versus unanticipated terms of trade shocks and the *J* curve phenomenon, *Journal of International Money and Finance* (2017), doi: https://doi.org/10.1016/j.jimonfin.2017.10.003

Allegret, J.P. Couharde C. and Guillaumin C. (2012). The impact of external shocks in East Asia: Lessons from a structural VAR model with blocks exogeneity. International Economics 132, pp. 35-89.

Arellano, C., A. Bulíř, T. Lane, and L. Lipschitz.(2009). "The dynamic implications of foreign aid and its variability."*Journal of Development Economics*. Vol. 88 (1): 87-102 cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte carlo evidence and an application to employment equations". *Review of Economic Studies*, 58(2), p. 277–297.

Arellano, M. and Bover, O. (1995), "Another look at the instrumental-variable estimation of error-components models".*Journal of Econometrics*, 68(1), p. 29–52.

Azam, J. P. (1997), Public debt and the exchange rate in the CFA Franc Zone.*Journal of African Economies*, Volume 6(1), pp. 54-84.

Azam, J. P. (1999), Institutions for macroeconomic stability in Africa. *Journal of African Economies*, Volume 8 (Supplement1), pp. 6-29. http://dx.doi.org/10.1093/jafeco/8.suppl_1.6

Azam, J. P. (2001), "Inflation and Macroeconomic instability in Madagascar", African Development Review, vol.13 (2), December: 175-201

Badinger, H. (2010). "Output volatility and economic growth."*Economic Letters.*Vol. 106: 15-18 cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Balanika V.P (2013), The Impact Of Trade Openness On Economic Growth, Evidence in Developing Countries, Unpublished Masters thesis Erasmus School of Economics, Erasmus Universiteit Rotterdam.

Baltagi H (2005) "Econometric analysis of Panel Data" 3rd Edition, ISBN: 0-470-01456-3

Broda, C. (2004) Terms of trade and Exchange Rate Regimes in Developing Countries. *Journal of international economics* 63 (1), pp. 31-58

Broda, C. (2004). "Terms of trade and exchange rate regimes in developing countries."*Journal of International Economics*. Vol. 63 (1): 31-58 cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

David, H. L. (2008). So You Want to Use a Measure of Trade Openness? In K. Banaian, B. Roberts, P. Macmillan, & L. H. David (Eds.), *The Design and Use of Political Economy Indicators*

DeJong, D. N. B. F. Ingram, and Whiteman C. H. (2000) Keynesian impulses versus Solow residuals: identifying sources of business cycle fluctuations. *Journal of Applied Econometrics* 15, pp. 311-329.

Demetriades, P. and LawS.H. (2006).“Finance, Institutions and Economic Growth”. *International Journal of Finance and Economics*, 11(3), 245-260

Dimitrios A. and Stephen G. (2007) “Applied Econometrics” Revised Edition. ISBN-13:978-0-230-50640-4

Dollar, D. and Kraay, A. (1992), Institutions, Trade and Growth, *Journal of Monetary Economics* 50, 133-162

Dollar, D., and Kraay, A. (2002).Trade, growth, and poverty.*Economic Journal, 114*(493), F22 F49.http://dx.doi.org/10.1111/j.0013-0133.2004.00186.x

Drugeon, J. P. and Wigniolle B. (1996), Continuous-time sunspot equilibria and dynamics in a model of growth.*Journal of Economic Theory*, Volume 69, Issue 1, pp. 24-52. http://dx.doi.org/10.1006/jeth.1996.0036.

Du, Y, Ju, J, Ramirez, Carlos D., and Yao X (2017), Bilateral Trade and Shocks in Political Relations: Evidence from China and Some of Its Major Trading Partners, 1990-2013, *Journal of International Economics* (2017), doi:10.1016/j.jinteco.2017.07.002, PII: S0022-1996(17)30075 2, Reference: INEC 3061

Dumitrescu, E. I., and Hurlin, C., (2012).Testing for Granger non-causality in heterogeneous panels. Economic Modelling, 29(4), 1450-1460.

Dung T.L (2015), A Review of Modern International Trade Theories, *American Journal of Economics, Finance and Management*, Vol. 1, No. 6, 2015, pp. 604-614, ISSN: 2381-6864 (Print); ISSN: 2381-6902 (Online)

Easterly, W., R. Islam, and J.E. Stiglitz. 2000. “*Explaining Growth Volatility.*” Mimeo.World Bank. Washington D.C. cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master’s dissertation in Applied Economics: Development, University of Bordeaux

Eberhardt, M. (2012). Estimating panel time-series models with heterogeneous slopes. *Stata Journal, 12*, 1,61-71.

Eberhardt, M., and Teal, F. (2010). Econometrics for Grumblers: A New Look At Cross-Country Growth Empirics, *Journal Of Economic Surveys*, Forthcoming

Edwards, S. (2006). Monetary Unions, external shocks and economic performance: A Latin American perspective. International Economics and Economic Policy 3(3), pp. 225-247.

Erden, I and Ozkan I (2004) Determinants of international transmission of business cycles to Turkish Economy. Economic Modelling 36, pp. 383-390

Farshid. S, Akhoondzadeh. T and Reza. M. A (2014), The Triangle of Trade Liberalization, Economic growth and Income Inequality, Volume 2014, Year 2014 Article ID cacsa-00026, 15 Pages doi:10.5899/2014/cacsa-00026 Jel classification: C33, C36, D31, F43,

Fatás, A. and I. Mihov.(2005). “*Policy Volatility, Institutions, and Economic Growth.*”Discussion Paper No. 5388. CEPR cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master’s dissertation in Applied Economics: Development, University of Bordeaux

Fischer, S. (1991), Growth, macroeconomics, and development. In *NBER Macroeconomics Annual*, Volume 6, pp. 329-379.

Fleming. J.M (1962) Domestic Financial Policies Under Fixed and Under Floating Exchange Rates.Staff Papers, International Monetary Fund. Vol 9 (November), pp. 369-79

Flood, R. P. and Rose A. (2010).Inflation targeting and business cycle synchronization.*Journal of International Monetary Fund.*Vol 9 (November), pp 369-79

Francisco J. S and Luis A. P (2002), Trade Shocks and Aggregate Fluctuations in an Oil Exporting Economy JEL classi¯cation numbers:E32, E37

Frankel, J. and Romer D. (1999). Does trade cause growth? *American Economic Review* 89 (3): 379-399.

Funke, N Granziera E. & Iman P (2008), Terms of Trade Shocks and Economic Recovery, IMF Working Paper, African Department, 2008 *International Monetary Fund, WP/08/36*

Ghironi, Fabio, and Marc J. Melitz.(2005). International trade and macroeconomic dynamics with heterogeneous firms.*Quarterly Journal of Economics* 120, no. 3: 865-915.

Ghulam, M. Marian. R & David. K (2017), Growth, human development, and trade: The Asian experience, *Journal on Economic Modelling*, Retrieved from

Sciencedirect.com. Journal homepage: www.elsevier.com/locate/econmod, Economic Modelling 61 (2017) 93–101,JEL classification: F43 O10 O15 O19 O53

Giovanni, Julian di and A. Levchenko. 2006. "Openness, Volatility and the Risk Content of Exports." Paper presented at the conference *The Growth and Welfare Effects of Macroeconomic Volatility* by The World Bank, CEPR and CREI. Barcelona. 17-18 March 2006. cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Godwin, R (1951). The Nonlinear Accelerator and the persistence of Business Cycles. Econometrica 19, pp. 1-17

Granger, C. W., (1969).Investigating causal relations by econometric models and crossspectral methods. Econometrica: *Journal of the Econometric Society*, 424-438.

Gries.T & Redlin. M (2012), Trade Openness and Economic Growth: A Panel Causality Analysis, Center For International Economics, Working Paper No. 2011-06

Haddad, M.E., J.J. Lim, and C. Saborowski. 2010. "*Trade openness reduces growth volatility when countries are well diversified*." Policy Research Working Paper No. 5222.The World Bank.cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Hadri K. (2000). Testing for Stationarity in Heterogenous Panels.*Econometrics Journal*, 3, 148-161.

Hang T. N (2010), Trade Liberalization, Privatization and Economic Growth, Discussion Papers In Economics Working Paper No. 10-13, Department of Economics, University of Colorado at Boulder, Boulder, Colorado 80309

Harding, D. & Pagan A. (2005), A suggested Framework for classifying the modes of cycle research. Journal of Applied Econometrics 20(2), pp. 151-59

Hassan A. (2007). Exports and Economic Growth in Saudi Arabia: A VAR Model Analysis‖. Journal of Applied Sciences, 7:3649-3658

Heckscher, E. (1919) "The Effect of Foreign Trade on the Distribution of Income." *American Economic Association, Readings in the theory of International Trade*, *Philadelphia*

Hirata, H., Kim H.S, & Kose M.A. (2007). Sources of fluctuations: the case of MENA: Emerging Markets and Trade 43(1), pp. 5-34

Hoffmaister, A.W. and J.E. Roldós. 1997. "*Are Business Cycles Different in Asia and Latin America?*" IMF Working Paper No.WP/97/9. International Monetary Fund, cit cited in Joya O. (2011), Macroeconomic Instability in Afghanistan: Causes and Solutions, unpublished Master's dissertation in Applied Economics: Development, University of Bordeaux

Im K., Pesaran H. and Shin Y. (2003). Testing For Unit Roots in Heterogenous Panels.*Journal of Econometrics*, 115, 53–74.

Iqbal, N. and Nawaz S. (2010), *Fiscal Decentralization and Macroeconomic Stability*: *Theory and Evidence from Pakistan*. Pakistan Institute of Development Economics, Islamabad

Irwin, D. and Terviö, M. (2002), Does Trade Raise Income? Evidence From the Twentieth Century, *Journal of International Economics* 58, 1-18.

Iyoha, M and Okim, A. (2017), the Impact of Trade on Economic Growth in ECOWAS Countries: Evidence from Panel Data,*CBN Journal of Applied Statistics Vol. 8 No. 1, June, 2017*, JEL Classification: F10 F43 C23

Jamilah, I. Zulkornain. Y and Muzarar. S.H (2016), Trade Openness and Economic Growth: A Causality Test In Panel Perspective, International *Journal of Business and Society, Vol. 17 No. 2, 2016, 281-290*