Relationship between Crude Oil Export and Economic Growth in Selected AEC countries (Bangladesh, Philippines, Indonesia, Malaysia and Thailand) Using the Panel Bayesian VAR model

YI YI WIN[1]

Abstract

This paper examined the economic impact of crude oil exportation on selected ASEAN countries (Bangladesh, Philippines, Indonesia Malaysia and Thailand) from 2008 – 2017. The objective of the study is to look at the impact of oil exportation on the economic growth in these selected countries. Secondary data were collected based on the model used in the research work and unit root test was conducted on the data to test their stationary, after which Panel Bayesian Vector Autoregressive (PBVAR) model was adopted to examine the relationship between them and impulse response was also employed for the analysis. The result obtained from the empirical analysis shows that the higher performance of the export and oil rents are the major influencing factors for the economic growth of the selected AEC countries.

Keywords: Crude oil export, selected AEC countries, Panel Bayesian VAR

Introduction

The role of exports in economic growth is not a new research topic in the field of international trade and economic growth, but it remains important to economists and

policymakers in formulating a proper growth policy. The effect of economics of scale, industrialization, and import of capital goods and intermediate will be increased by exports. Ultimately, exports will also increase foreign exchange earnings and create more employment opportunities in the domestic market. This paper seeks to investigate the relationship between crude oil export and economic growth and its impact on oil export countries. Business and financial economists pay significant attention to the impact of oil and other energy prices on economic activity, but the mainstream theory of economic growth pays little or no attention to the role of natural resources in promoting or enabling economic growth. Owing to its strategic nature, oil is an important commodity, affecting world economies. The empirical analysis starts by analyzing the panel, analytic properties of the data which is followed by examining the nature of causality among variables. Positive oil price shock tends to affect the economies of oil importing countries differently than oil exporting countries. Increasing Crude oil price might be considered bad for oil importing countries, but good news for oil exporting countries. The reverse might be expected for oil price decrease. The causal relationship between energy consumption and economic growth has been widely studied. The direction of causality is highly relevant to policy makers. Oil is an input in the production process, since it is used in other economic activities. Many countries deficiency energy resources and generally depend on imports of crude oil, natural gas, and coal for their industrial and residential energy needs, transportation, and electricity generation. In these cases, there is a positive relationship between energy consumption and economic growth.

The purpose of this research is to explore the effect of crude oil export on the economic growth in selected AEC countries over a period of 10 years (2008- 2017). Methodology adopted in this research is Panel Bayesian Vector Autoregressive Model. Variables are selected upon the criteria and guidelines of theories, previous empirical evidences and

availability of the data. Even though there still have many factors that affects economic growth, the author could not include all of them because of data limitations and methodology constraints.

Literature Review

Meaning of crude oil

Crude oil is a naturally occurring, unrefined petroleum product composed of hydrocarbon deposits and other organic materials. A type of fossil fuel, crude oil can be refined to produce usable products such as gasoline, diesel and various forms of petrochemicals. It is a nonrenewable resource, which means that it can't be replaced naturally at the rate we consume it and is therefore a limited resource.

Many theorists such as **Idowu (2005)** argued extensively on the relationship between oil exports and economic growth in Nigeria using Johansen's multivariate Co-integration technique. After his test analysis, he concluded that there is a stationary relationship between oil exports and economic growth. He also said that there is a feedback causality between Oil export and GDP. **Akanni(2007)** used the PC-Give 10 (ordinary least square regression) to evaluate if oil exporting countries grows as their earnings on oil rents increases. After his test analyses with OLS, the result turned out to be positive and significant, that means there is a positive relationship between Oil rents and economic growth. Akanni concluded in his analysis that Oil rents in most oil developing countries in Africa do not promote economic growth.**Hadi, etal (2009)** made an investigation using Cobb-Douglas production function to check if the income generated from Iran's Oil export has an impact on their economy.The result stated that Iran's economy adjusts quickly to shocks and there level of technology is progressing. Therefore oil exports to Iran contributed to their real income through real capital

accumulation. Also **Mohammed and Amirahi (2010)** made an investigation using Error correction model of ARDL to check if factors like world oil demand and supply, oil price and production capacities enhances export growth in Iran. From their result, the observation made was that there is an inverse relationship between consumption of oil products and revenues from oil export. **Khaled, etal (2010)** conducted a Causality test using Co-integration method to test if export sector in Libya enhances economic growth in Libya. From the result obtained, it shows that exports, price relatives and income are statistically co-integrated. Therefore Khaled concluded that both value of export and economic growth are related to each other. According to **Odularu (2010),** he made an empirical investigation on the impact of crude oil production on Nigeria economic growth with the use of ordinary least squares and CobbDouglas production functions. His result showed that the production of crude oil in Nigeria contributed well to economic growth but has not made any significant improvement on the level of economic development. **Khadijat, Afolabi (2011)** carried out an empirical research on the impact of crude oil export on Nigeria economy using the Ordinary least square method (OLS) as his econometric technique to test its significance. From his result, it shows that some of the explanatory variables (labor, domestic consumption, crude oil export and total production) are statistically significant while capital is statistically insignificant. Khadijat concluded in his research that there is apparently a significant relationship between oil export and economic growth in Nigeria. **Samadi (2011)** also used VEC Granger Causality and Wald Test to test the hypothesis which stated that there is a relationship between exports and economic growth in Algeria. After the test analysis, the result reveals that the explanatory variables are non-stationary and therefore there is a causal relationship between economic growth and exports.

Table 1: Summary of the Empirical Studies Discussed and their Findings

| Year	Authors	Research	Methodology	Findings
2005	Idown	Relationship between oil exports and economic growth in Nigeria	Johansen Multivariate co-integration technique	Stationary relationship between export and GDP
2007	Akanni	Does Oil Exporting Countries grows as their earnings on oil rents increases	Ordinary least square (OLS)	There is a positive relationship between oil rent and economic growth in oil exporting countries
2009	Hadi, etal	Impact of Oil export in Iran economy.	Cobb-douglas production function	Oil exports contribute to real income through capital accumulation
2010	Mohammed and Amirahi	Does factors like world oil demand and supply,oil price and production capacities enhance export growth in Iran	Error correction Model	There is an inverse relationship between consumption of oil products and revenues from oil export
2010 .`	Odularu	Impact of crude oil production	Ordinary Least square and Cobb-	Crude oil production contributed

		on Nigeria economic growth	douglas production function	to Nigeria economic growth but had no significant improvement on economic development
2011	Samad	Relationship between exports and economic growth in Algeria	VEC Granger Causality and Wald test	There is causal relationship between exports and economic growth

The research framework and methodology
The conceptual framework of the research

In this study, the author examined the relationships between economic growth and crude oil export of the selected AEC countries (Bangladesh, Philippines, Indonesia, Malaysia and Thailand) by applying PBVAR to estimate the relationship of variables and this study relies on previous researches and empirical studies.

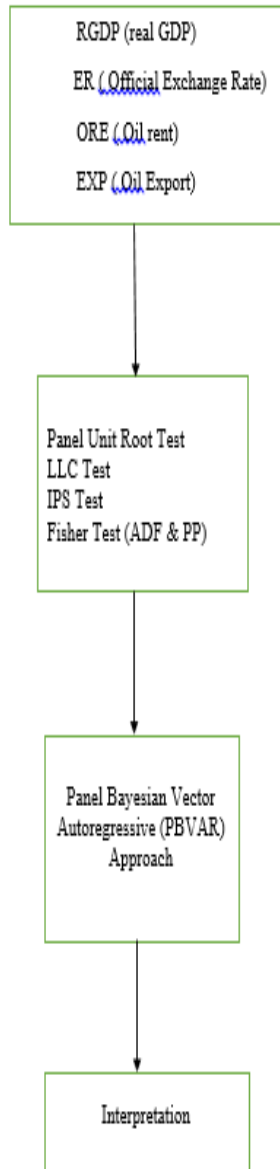**Figure 1:** Conceptual Framework of PBVAR model
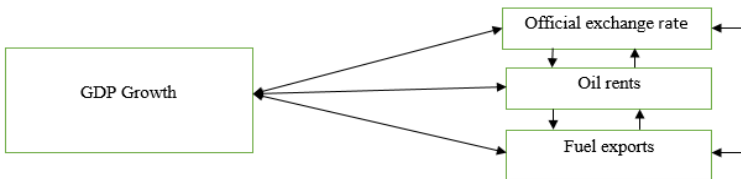
Source: Author's Illustrations

The author studied the determinants of economic growth in the selected AEC countries based on the other research papers, empirical research and theories. Many other variables may also affect the economic growth of AEC countries, but the author collected the data with the aim to achieve the objective of this study. For this reason, the author looks into the relationship between economic growth and crude oil export using Panel Bayesian VAR approach. The conceptual framework for this study is shown as in Figure 1.

In this study, the author selected the variables that are available and suited to the model and methodology. In reality, there have many variables that effect on the economic growth in these AEC countries and many ways to take the research. Apart from, many studies have been developed related to this area with different country groups. However, the author would like to analyze the determinants of economic growth in these countries and interrelationships between them by using Panel Bayesian Vector Autoregressive (PBVAR) model.

The author collected the secondary data for the study period of 2008-2017 which has 50 observations. Moreover, the author tested the collected data with panel unit root tests which are Levin-Lin-Chu (LLC 2002), I'm-Peasaran (2003) and Maddala (1999)and ADF & PP test. Based on the test results of panel unit root tests, the author tried to test with different panel data analysis. The research process is as shown in Figure 2.

Endogenous variables

RGDP (real GDP)

ER (Official Exchange Rate)

ORE (Oil rent)

EXP (Oil Export)

↓

Panel Unit Root Test
LLC Test
IPS Test
Fisher Test (ADF & PP)

↓

Panel Bayesian Vector
Autoregressive (PBVAR)
Approach

↓

Interpretation

Source: Author's Illustrations

Variables Used in the Model and Sources of Data

In this study, the author tests and estimates these data by applying Bayesian VAR (Karlsson, 2012) estimators for panel level. The data or information initially collects in a large format from the World Bank and IMF in the form of spreadsheets of numerical data which are summarized, and analyzed before test results and conclusions. The observed variables used and their sources for this research are as discussed in the below Table 2. The author collected those data of selected AEC countries for the period of 2008-2017 from World Bank, IMF.

Table 2. Variables, Definitions, Proxies and Data Sources

Variables Notation		Proxy/ Determinants	Definition	Units	Data Sources
RGDP	X (Y)	Economic Growth	As a % of real GDP	%	World Bank
ER	)	Official exchange rate (LCU per US$, period average)	Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market	as an annual average based on monthly averages (local currency units relative to the U.S. dollar).	International Monetary Fund
ORE		Oil rents	the difference between the value of	%	World Bank

			crude oil production at regional prices and total costs of production.		
EXP		Fuel exports	As a % of merchandis e exports	`%	World Bank

Source: Authors' Illustration

Empirical results and Findings

Result of Panel Unit Root Test

The standard unit root test, LLC,IPS, ADF& PP test was applied to determine the degree of stationary of the variables used in the model. Table 3 shows the calculated results of the panel data.

Table 3: Results of panel unit root test

Variable	Level	LLC			Probability	IPS			Probability	
Growth RGDP	I (0)	t	-3.67018***		0.0001	W-stat	-1.78306***		0.0373	Stationary`
Growth ER	I (0)	t	-7.95249***		0.0000	W-stat	-3.52643***		0.0002	Stationary`
Growth ORE	I (0)	t	-5.83801***		0.0000	W-stat	-2.81478***		0.000073	Stationary`
Growth EXP	I (0)	t	-3.20398***		0.0007	W-stat	-2.00653***		0.0224	Stationary`

Source: Author's Calculation

Note: *, ** and *** represent significance level at 10%, 5% and 1% respectively

Table 3: Results of panel unit root test (Continued)

Variable	Level	ADF		Probability	PP		Probability	
		Statistics			Statistics			
Growth RGDP	I(0)	Chi-square	20.1310**	0.0280	Chi-square	19.6450**	0.0328	Stationary`
Growth ER	I(0)	Chi-square	-34.2616***	0.0002	Chi-square	62.1698***	0.0000	Stationary`
Growth ORE	I(0)	Chi-square	27.9006***	0.0019	Chi-square	28.8171***	0.0013	Stationary`
Growth EXP	I(0)	Chi-square	9.58930***	0.0014	Chi-square	12.3527**	0.0054	Stationary`

Source: Author's Calculation by Stata 14

Note: *, ** and *** represent significance level at 10%, 5% and 1% respectively

Table 3 shows the results of four Panel Unit Root Tests performed on the first tests to check the stationary status, and this is the prerequisite of to apply Bayesian VAR model. The panel unit root tests used in this research are Levin, Lin and Chu (1992), IPS, ADF and PP Fisher Type tests to examine the individual variables with all possible ways by applying Stata software. As a result, these tests are used to make sure variables are not stationary at I (1) and I (2). All variables are stationary at the level I (0) by conducting growth form.

The Panel Bayesian Vector Autogressive model is based on the assumptions of all variables are stationary at the level I (0). None of the variables in this model are acceptable if the order of integration for stationary is I (1) and also I (2) and above. Therefore, it is essential for the data to be stationary at I (0) in order to fit with the criteria set for panel Bayesian Vector Autogressive model.

The results of estimation of PBVAR-model

This study is to examine the relationship between real GDP (RGDP), ER (Official exchange rate, ORE (oil rents) and EXP (oil export) of the selected AEC countries by PBVAR-Model. The Bayesian statistics approach is a very efficient method to estimate the panel vector autoregressive model. This approach can also reduce uncertain parameters and better forecasting accuracy ((Sune, 2015)). As an alternative to approximating VAR models, which need stationary at level I(0). As seen in table 4, the estimation results indicate that real GDP has an own positive shock and, also on official exchange rate, oil export and negative shock on the oil rents. The official exchange rate has an own positive shock and also on the real GDP and oil exports and negative shock on the oil rents. The oil rents have a negative own shock and also on the official exchange rate and positive shock on the oil rents and oil exports. The oil exports have positive shock to real GDP and negative shock to the official exchange rate and also positive shock on own itself. This interpretation is relatively less important than Impulse Response Function.

Table 4: Presenting the results of estimation from PBVAR-Model.

Variables	RGDP	ER	ORE	EXP
RGDP$_{it-1}$	0.797001 (0.04911) [16.2296]	3.82E-08 (1.5E-08) [2.52167]	-3.76E-13 (6.8E-13) [-0.54836]	7.36E-12 (2.3E-12) [3.20691]
RGDP$_{it-2}$	0.087330 (0.04235) [2.06231]	3.73E-10 (1.3E-08) [0.02865]	-8.47E-13 (5.9E-13) [-1.43836]	-4.42E-12 (2.0E-12) [-2.23628]
ER$_{it-1}$	211492.4 (317539.) [0.66603]	0.017938 (0.09952) [0.18024]	-3.59E-07 (4.5E-06) [-0.08061]	8.32E-06 (1.5E-05) [0.55742]
ER$_{it-2}$	53907.74 (159328.) [0.33834]	-0.001818 (0.04994) [-0.03641]	-8.87E-08 (2.2E-06) [-0.03968]	1.73E-06 (7.5E-06) [0.23119]
ORE$_{it-1}$	-1.08E+10 (4.4E+09) [-2.47989]	-405.4697 (1350.73) [-0.30019]	0.554956 (0.06136) [9.04404]	0.771854 (0.20476) [3.76949]
ORE$_{it-2}$	-9.90E+08 (3.0E+09) [-0.33324]	-131.7038 (922.186) [-0.14282]	0.129159 (0.04201) [3.07432]	0.084632 (0.13977) [0.60553]
EXP$_{it-1}$	3.19E+09 (1.2E+09) [2.75842]	-353.4917 (358.314) [-0.98654]	0.030643 (0.01621) [1.89029]	0.694058 (0.05461) [12.7096]
EXP$_{it-2}$	6.67E+08 (9.0E+08) [0.73954]	116.7167 (279.701) [0.41729]	0.003789 (0.01265) [0.29964]	0.110608 (0.04274) [2.58767]
C	4.48 E+10 (9.6E+09) [4.67985]	-7627.268 (2972.18) [-2.56622]	0.362632 (0.13447) [2.69682]	-0.508013 (0.45049) [-1.12769]
R-squared	0.972281	0.345081	0.878862	0.970048
Adj.R-squared	0.965128	0.176070	0.847601	0.962318
Sumsq. resids	7.44E+22	5.17E+09	9.530232	138.9470
S.E. equation	4.90E+10	12914.59	0.554461	2.117111
F-statistic	135.9209	2.041764	28.11336	125.4985
Mean dependent	4.08E+11	3834.421	1.221863	10.78567
S.D. dependent	2.62E+11	14227.72	1.420298	10.90634

Source: Author's Calculation by Eviews 8

Noted: Standard errors in ( ) & t-statistics in [ ]

Moreover, the estimation results of Impulse Response Function (IRF) (shown in figure 4) indicated that whenever one standard deviation (one S.D. Innovations) of five selected ASEAN countries was shocked, then its effects on all variables, including RGDP, ER, ORE and EXP.
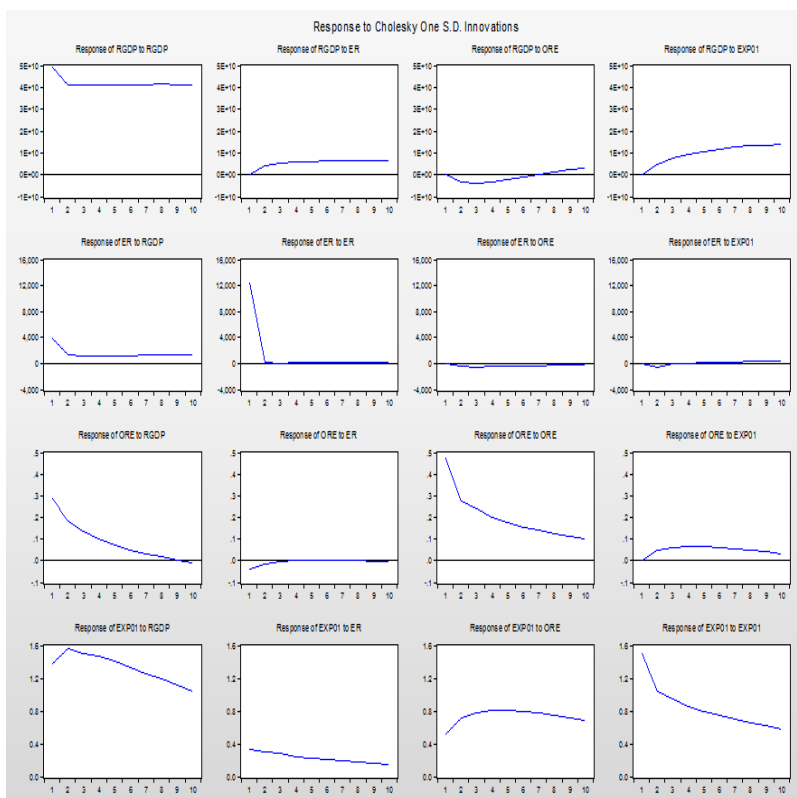
Figure 4: The presentation of Impulse Response Functions (IRF) for the information for RGDP, official exchange rate, oil rents and oil export of Bangladesh, Philippines, Indonesia, Malaysia and Thailand

According to the Impulse Response Function, the result shows that when the selected AEC countries had economic shocks by one standard deviation in real GDP, it had a continuing positive effect on it for the whole period. In the case of the response of real GDP to exchange rate, it means that real

GDP is affecting to exchange rate in that about nine years has a continuing positive effect from the beginning to the end. Additionally, the next graph shows that the response of real GDP to oil rents, meaning that real GDP is a negative affect to oil rents in that about six years and turn to the equilibrium and after that positive effect in the future. Also the response of real GDP to oil export case, it has the totally increasing positive effect from the beginning to the end.

In response of exchange rate to real GDP graph, it has a positive impact to RGDP. Exchange rate is affecting to itself and exchange rate is firstly positive effect and then goes to the equilibrium from the eight years and in the case of the response of exchange rate of oil rents is a negative effect for about six years and after the six years it be returns to the equilibrium. Again the response of exchange rate to oil exports has a negative effect for the first one year and then return to the equilibrium.

In the graph of the response of oil rents to real GDP, oil rents are affecting to real GDP has a positive effect and downturn to the equilibrium after on RGDP and after nine years. In the case of the response of oil rents to exchange rate, it has a negative for the first three years and goes to the equilibrium for the rest of the year. The response function of the oil rents to itself has a totally positive for the ten years and similar with other variables as showed by the above Impulse Response Function.

Conclusion

In this paper, the authors described and implemented a Bayesian inference for revising the relationship between oil export and economic growth. The impulse response function result presented that each variable is sensitive to them when any shock affected to the economic system and the set of circumstances in the selected AEC countries. The analysis of this research concludes that higher performance of the export and oil rents are the major influencing factors for the economic growth of the selected AEC countries including Bangladesh, Philippines, Indonesia Malaysia and Thailand and exchange rate is less sensitive than the previous factors.

References

Abdul -Hadi Abbas HAdi and Faten Hassan Yassin. (2016). *Impact of Cybermethrin on Some Biochemical Parameters in Rat* . Kufa Journal for Veterinary Medical Science , University of Kufa, AI-Najaf, Iraq.

amirahi and Mohammed . (2010). *OIl Exportation and Economic Growth in Nigeria.*

A.O., K. (1978). *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences.* Cambridge: Ballinger Publishing Co. for the National Bureau of Economic Research.

Anderson,J and D.marcouiller. (2002). *Insecurity and the Pattern of Trade:An Empirical Investigation.* American : 342-352.

Anderson< J and E.van Wincoop. (2003). *Gravity with Gravitas:A solution to the Border Puzzle.* American: 170-192.

Bhagwati, J. (1978). *Anatomy and Consequences of Exchange Control Regimes.* Cambridage: Co for the NAtional Bureau of Economic Research.

Boatma, K. (1992). *Telecommunications System Quality and Export Performance.doctoral dissertation.* Maryland: College Park.

Bougheas, S. D. (1999). *Infrastructure, transport costs and trade.* Journal of International Economics47:169:189.

Chang, R. k. (2005). *Openess can be good for Growth:The Role of Policy Complementarities.* World Bank policy research working paper no 3763. September.

Clair, G. G. (2004). *Notes on CEPII's distances measures.* Paris.

Coe, D. T. (2002). *The missing globalization puzzle.* IMF workinfg paper WP/02/171.

D.I Akanni and S.O Ojeniyi. (2007). *effects of different levels of Poultry Manure on Soil Physical Properties , Nutrients Status, Growth and Yield of Tomato.* volume 1, page no 1-4.

Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi. (2005). *Governance Matters IV:Governance Indicators for 1996-2004.* World Bank Policy Research Working Paper Series N0.3630.

Deardorff, A. (1988). *Determinants of Bilateral Trade : Does Gravity Work in a Neoclassicial World?in J.Frankel ed.* Chicago: The Regionalization of the World Economy . University of Chicago for the NBER, 1998.

Depken II, C. R. (2005). *Asymmetric Effects of Econpmic Freedom on International Trade Flows.* International Journal of Business and Economics 4(2) 141-155.

DisdierII, C. a. (2003). *Exaggerated Reports on the Death of Distance: Lessons from a Meta- Analysis.* mimeo, TEAM, Universit'e de Paris I Panth' eon Sorbonne.

Dollar , D and A. Kraay. (2002). *Trade , Growth and Poverty .* Economic Journal 114:F22-F49.

Dollar, D. A. (2004). *Trade and Growth.* Journal of Monetary Economics.50:133-162.

Edwards, S. (1993). *Openess , Trade Liberalization and Growth in Developing Countries .* Journal of Economic Literature31:33:1358-1393.

Evenett, S and A.J.Venables. (2003). *Export Growth in Developing Countries :Market Entry and Billateral Trade .* working paper, Lndon School of Economics.

Evenett, S. W. (2002). *On Theories Explaining the Success of the Gravity Equation .* Journal of Political Economy 110(2):281316.

Felbermayr, G. (2004). *Exploring the Intensive and Extensive Margins of World Trade .* Cesifo Working Paper Series No.1276,CESifo GmbH.

Francois, J.F and J.Woerz. (2006). *Rags in the High Rent District: the Evolution of Quota Rents in Texitiles and Clothing .* CEPr discussion paper.

Freund, C and B. Bolaky. (2002). *Trade , Regulations and Growth .* World Bank poicy research working paper no. Wmber.PS 3255, November.

Greenaway,D.W.Morgan and P.Wright . (2002). *Trade Liberalization and Growth in Developing Countries .* Journal of Development Economics 67:229-224.

Greenne, W. (2003). *Econometric Analysis:5th edition.* New Jersey.

Havemann,J and D.Hummels . (2004). *Alternative Hypotheses and the Volume of Trade :the Gravity Equation and the Extent of Specialization .* Canadian Journal of Economics 37(1):199-218.

Heckman, J. (1979). *Sample Selection Bias as a Spciafication error.* Econometrics 47 :152-161.

Hummels ,D and Klenow,PJ. (2005). *The Variety and Quality of a Nation's Export.* The American Econoic Review 95(3):704-723.

Idowu. (2005). *Non-Oil export Determinant and Economic Growth Nigeria(1988-2008).*

J., A. (1979). *A Theoretical Foundation for the Gravity Equation.* American: 106-116.

Ievchenko, A. (2004). *Institutional Quality and International Trade.* IMF Working Paper 04/231.

Limo,N..and A.J . Venables. (2001). *Infrastructure, Geographical Disadvantage, Transport Costs and Trade.* World Bank Economic Review15:451-479.

Mtys, L. (1997). *Proper Econometric Specificatio of the Gravity Model.* The World Economy20:363-368.

Odularu. (2010). *Impact of oil export on economic growth in Nigeria.*

Ranjan,P.and J.Y.Lee. (2003). *Contract Enforcement and the Volume of International Trade in Different Types of Goods.* mimeo,UC Irvine.

Roberts, M.J and J.R. Tybout. (1997). *The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs.* The American Economic Review 87(4):545-564.

Rodriguez, F and D.Rodrik. (1999). *trade Policy and economic growth :a skeptics guide to the cross-national evidence.* CEPR discussion paper 2143.

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