Imported Intermediate Inputs and Manufactured Exports in Nigeria: The Role of Dual Exchange Rate Regime

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Abstract

This study examines the direction and significance of imported intermediate inputs on manufactured exports in Nigeria under the role of dual exchange rate regime between the period of Q1 2000 to Q4 2018 using data sourced from the World Bank, African Development Bank and Central Bank of Nigeria databases. Vector Error Correction Model was employed to ascertain the relationship among the variables. The results show that all explanatory variables are cointegrated in the long run. The findings from the impulse response analysis points to the existence of a negative response from imported intermediate inputs to manufacturing export, though statistically insignificant. The results indicate a positive and significant response of exchange rate spread on export performance. The result of the Variance Decomposition shows that in addition to own shocks, between 5 to 12 per cent of the variations in manufacturing export are due to shocks in imported intermediate inputs and exchange rate spread respectively. Policy that will work towards achieving a unified the exchange rate system, boosting intermediate imports of intermediate inputs used by local manufacturers to help expand manufacturing exports are recommended based on the findings.

Key words: Manufacturing exports, imported intermediate inputs, exchange rates spread, trade openness, Africa infrastructure development index

JEL Classification Code: C53, D21, D51

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1. Introduction

Nigeria's exports are predominantly primary products from the agriculture and extractive sectors, thus making her rely heavily on import of finished products to meet domestic demand. This trend has remained a major constraint to growth in Africa (Rodrik, 2007; World Bank, 2000). This is in contrast to the development in some of the Asian countries whom mainly rely on exports of their manufactured products. Statistics reveal that manufactured exports (as% of merchandise goods) in Indonesia, Malaysia and Thailand stood at 44.72%, 69.50% and 77.46% respectively in the period of 2018 while in Nigeria this is still at a low threshold of 3.6% against 26.83% average in sub-Saharan Africa (World Bank's World Development Indicators, 2018). This is an indication that the contribution of manufacturing sector exports remains abysmal amid concentration on primary commodities of oil and agro-products. This performance can be attributed indirectly to the inability to apply foreign technologies to increase productivity and spur export diversification (see Simon-Oke& Aribisala 2010, United Nations Conference on Trade and Development, 2018) and the share of firms that are engaged in two-way trade i.e. both import and export (World Bank's World Development Report 2020). As a result, value addition to raw materials export in Nigeria is at the lowest ebb because only the labour element of value addition is visible while technology and material elements remain absent (Deinibiteim, 2018). This is in spite of the implementation of the export processing zones strategy in Nigeria since 1992 to encourage the exports of manufactured goods and accelerate industrialization.

The idea of transfer of technology through importation of intermediate/capital inputs is credited to Veblen (1915) and later Solow, (1956) using the case of Germany's quest to catch up with the United Kingdom. This kind of approach was adopted during the Meiji Era in Japan when intermediate inputs were imported from European and U.S. (see Mathews & Cho, 2000, and Amsdenv & Chu, 2004). Thus, the import of intermediate/capital inputs remains an essential component to drive the growth of manufacturing sector exports (see Grossman & Helpman 1991; Lee, 1995, and Ogbonna, 2015).The international trends and as verified by empirical studies is that countries that use imported capital equipment derive benefits because these products embody foreign knowledge (Chuang, 1998, and Iyoboyi & Na Allah, 2014) and new technologies (Amiti and Konings, 2007; Yu, 2013; Gopinath and Neiman, 2013; Bas and Strauss-Kahn, 2014 and Fan *et. Al*, 2015). Unfortunately, in Nigeria, many challenges confront the manufacturing sub-sector (especially small and medium industries) in acquiring imported intermediate inputs which are related to the access to foreign exchange (Uma, Obidike, Chukwu, Kanu, Ogbuagu, Osunkwo, & Ndubuisi, 2019).

In a dual exchange rate system, there are both fixed and floating exchange rates, with the fixed determined by monetary authority against other foreign currencies while floating is determined by the private market through forces of supply and demand. Nigeria's dual exchange rate is characterized with official and bureau de change (also known as black market) rates. Consequently, the co-existence of official exchange and black-market rates seem injurious to investors because the restriction on the former leaves the latter window facing pressure because of high speculative demand, thus creating wider gap between the official rate and black-market exchange rate. This, according to QuartzAfrica, (2017) has high cost implications for imported intermediate inputs. Also, since the strength of domestic currency is influenced by international prices of commodities, the hypothesis is that the exchange rate regime in Nigeria might have an implication on its export performance.

Economic theory postulates that rising exchange rate implies a depreciation of nation's currency consequently, making exports of such a nation cheaper while its imports become expensive (Orji, Ogbuabor, Okeke & Anthony-Orji, 2018). Overvaluation of foreign exchange rate, therefore, is a hindrance to the success in manufacturing exports (Collier & Gunning, 1999). CBN (2016) further alludes that when more domestic currency is exchanging for foreign currency, it translates to depreciation of domestic currency. The Nigerian currency, the Naira, depreciated against the US dollar to ₦306.080 and ₦361.36 in 2018 from ₦102.105 and ₦113.48 in 2000 in the official and black windows respectively. The gaps in exchange in the two market segments suggest restrictions in the official channel, which aligns with the report of International Monetary Fund (IMF) (2017) Nigeria's current exchange rate regime exhibits some exchange restrictions.

The crux of this study is that there is a low threshold of manufacturing exports in Nigeria and empirical findings are that Nigeria's manufacturing export is characterized with inputs too obsolete to spur export productivity. On the other hand, there is rising rate of Naira exchanging for foreign currency (specifically US$) with adverse effect on manufacturing export in terms of capital importation. The coincidence of these trends raises an important question about Nigeria's manufacturing industry.

Empirically, the nexus between imported intermediate inputs and manufacturing export such as Olper, Curzi, and Raimondi, (2017), Feng, Li and Swenson (2016), Yu and Li (2014), Habiyaremye, (2015), Sharma, (2014), Iyoboyi and Na-Allah (2014), Adeoti, (2012), Greenaway, Kneller and Zhang, (2010), Adeoti, (2012), Veeramani (2008) is more specific on selected manufacturing sector performance. Interestingly, none of these studies look at the aggregate implication of imported intermediate inputs on manufacturing export in more recent times Similarly, other studies of Hunegnaw (2017), Pamommast, Jermsittiparsert and Sriyakul (2013), Otokini, Olokoyo, Okoye and Ejemeyovwi (2018) did not look into the likely influence of dual exchange rate on manufacturing export either due to the scope or peculiarity of the study area. Thus, this study pursues this study to interrogate current issues militating against the nation's manufacturing export performance using recent data and a wider coverage.

The motivation of this study is that intermediate imported inputs are necessary components for international competitiveness of manufactured export goods. However, the investigation of intermediate inputs and manufacturing export is limited by theory and empirical consideration. Secondly, an enhanced understanding of the direction and significance of intermediate inputs has become increasingly germane towards boosting expansion of Nigerian manufacturing export. In addition, while effect of exchange rate movements on exports is well-established in analysis of Nigeria, there is much less consideration of the effect of differences in official market exchange rate and bureau de change on manufacturing export in Nigeria.

Arising from the above, this study represents one of the efforts towards testing the nexus between imported intermediate inputs and manufacturing export in Nigeria under the influence of dual exchange rate regime. Specifically, the study aims to revisit the direction and significance of imported intermediate inputs on manufacturing export and the role of dual exchange rate on manufacturing export using impulse response and variance decomposition approach under the Vector Error Correction Model (VECM).

The rest of the paper is structured as follows: Section 2 presents a review of related literature; Section 3 presents methodology and model; Section 4 holds the analyses and discussion of results; while Section 5 concludes the paper.

2 Literature Review

2.1 Conceptual Clarification

Economic literature refers to imported intermediate inputs to be essential components that facilitate production process. Imports of intermediate inputs play an important role in producing new products, especially those located further downstream along supply chains (Benguria, 2014, Baldwin 2012; Goldberg et. *al*, 2010). Generally, the benefit of using variety of modern inputs in export production process is well-known (Feng, Li & Swenson, 2016).

Manufacturing export, as a key component of structural transformation and of gross domestic product (GDP), refers to total semi-finished and finished products that meet exportable international market standard. Aside being a source of foreign exchange earnings, literature reveals that there are a lot of benefits from exporting such as efficient management and production techniques (Grossman and Helpman, 1991; Edwards, 1993). Studies such as Hausmann et al. (2007), Jarreau and Poncet (2012), Crespo-Cuaresma and Wörz (2005) and Berg et al. (2012) argue that countries that pursue manufacturing exports perform better than primary product exporters. This conclusion reaffirms the position of Export-Led Growth (ELG) hypothesis that an expanding export sector is a significant determinant of the long-run economic growth of an economy (Ogbonna, 2015).

There are different exchange rate regimes across the globe. There are two main types of exchange rates in Nigeria: official and market exchange rate (known as bureau de change rate). The official exchange rate is determined by the monetary authority/central bank, while the market exchange is basically determined by market forces of demand and supply (CBN, 2016). CBN, therefore, defines dual exchange rate as the difference between the official market exchange rate and bureau de change rate. Economic theory proposes that a country's import and export are affected by its currency exchange rate (Orji, Ogbuabor, Okeke & Anthony-Orji, 2018).This study is concerned with the likely role it plays in manufacturing export growth.

2.2 Theoretical Framework

This study is anchored on the theory of Global Value Chains (GVC). Gereffi's (1994, 2018) GVC framework describes the organization of international production networks and international fragmentation of production to include both the goods and services. Attempting to move beyond the traditional trade modes of reproducing the whole value chain, it maintains that countries integrate into the global value chains or international division of labour by either forward participation i.e. selling raw materials or parts to other countries, who then incorporate these imports into their production for exports or else by backward participation i.e. importing parts and components from abroad to be used in their own exports. And some countries can do both forward and backward participation in GVCs trade. According to World Bank's World Development Report 2020, the global fragmentation of production is made possible by factors such as hyper-specialization, the relationship between local suppliers' network and lead firms; improvements in transport and communications infrastructure; exchange rate liberalization; and trade reforms and removal trade barriers among others. For example, trade barriers increase the cost of imported intermediate inputs and thus can reduce backward GVC participation. Thus, a country-specific characteristics and policies for increasing industry's value-added is crucial for benefitting from GVC participation (Kummritz, Taglioni, and Winkler, 2017).

This idea reemphasizes the link between the macro-micro processes that are usually presumed to be in isolation within trade analysis'' (Gereffi, 2019). It argues that it is firms, not countries or industries that participate in international trade and global value chains. Therefore, individual countries global value chain participation is viewed in terms of its share of firms that are engaged in both import and export or two-way trade. To operationalize these conceptual ideas and the overall mechanism driving commodity chains, Gereffi (1994) highlighted three fundamental scopes of commodity chains and networks to include: (i) an input-output structure within value-adding economic activities; (ii) territoriality construct reflecting dispersion or concentration of production and distribution networks; and (iii) a governance structure that determines the allocation and flows of materials, capital, technology, and knowledge involved. This scope helps to clarify the GVC mechanism.

2.3 Empirical Review

The relationship between intermediate inputs and manufacturing exports as well as other macroeconomic variables has been examined by several researchers and the dynamics are presented in this section.

2.3.1 Imports of Intermediate Inputs to Manufacturing Exports

Olper, Curzi, and Raimondi, (2017) investigated the relationship between imported intermediate inputs and firms' productivity growth in the food industry in Italy and France. The regression results reveal that the productivity growth witnessed within the food industry is strongly accounted for by the increase in imported intermediate inputs. Feng, Li and Swenson (2016) examined the connection between imported intermediate inputs and exports of Chinese firms. Their findings demonstrates that intermediate input imports led to increase exports. This corroborated the findings of Yu and Li, (2014) as the quantity of imported intermediate inputs expand, firms' productivity increases.

Similarly, Habiyaremye, (2015) applied a Panel of 340 manufacturing firms to analyze the effects of imported capital goods on firm productivity growth and skills development in Botswana. Findings revealed that imported machines and equipment increase manufacturing productivity. Sharma, (2014), using the production function and growth accounting method, showed that impact of imported intermediary goods on firm productivity is positive and significant in Indian manufacturing industries during the period, 2000–09.

Adeoti, (2012) assessed technology-related factors as determinants of export potential of Nigerian manufacturing firms. Using logit regression analysis of the export model, the study showed that the export potential of firms is inclined by size of the business units. Greenaway, Kneller and Zhang, (2010) adopted Panel technique and revealed that real exchange rate appreciation hikes price of export and lowers imported inputs.

Many of these studies are specific on selected manufactured goods export performance indicators but these might not represent what is obtainable in the entire sector. Arising from this, this study looks at the significance of importation of intermediate inputs on the size of manufacturing exports in Nigeria using Vector Error Correction Method (VECM) that can estimate both the long-run and short run relationships.

2.3.2 Importation of Intermediate Inputs and other Macroeconomic Variables

Ogbonna (2015) assessed the causal effect of disaggregated import on economic growth using Johansen Cointegration and the result demonstrates that the relationship between economic growth and import variables in Nigeria are stable and coalescing in the long run. Iyoboyi and Na-Allah (2014) undertook a study on the impact of innovation through the use of imported capital goods on economic growth in the Nigerian economy during the period 1970-2011. Their findings showed that there is a positive significant association of between imported capital goods on economic growth. In a similar study by Veeramani (2008) using panel data of 90 countries to analyzed the impact of imported capital goods on growth of an economy for the period of 1995-2005. Findings showed that imported capital goods led to a faster growth rate of income per capita in the period. Arawomo (2014) examined the same relationship in the West Africa Monetary Zone (WAMZ) comprising of Nigeria, Ghana, Gambia, Guinea, Liberia and Sierra Leone countries between 1970 and 2012. Findings associated GDP growth to capital import in both short-run and long-run, and the size of coefficient was stronger in the long-run.

2.3.3 Exchange Rate and Manufacturing Sector Exports

Considering Pooled Mean Group and Mean Group Estimators and Autoregressive Distributed Lag Model based on 10 Eastern Africa countries, Hunegnaw (2017) revealed that real effective exchange rate improves manufacturing sector exports in the long-run horizon though with negligible magnitude. Pamommast, Jermsittiparsert and Sriyakul (2013), using Thailand data, revealed that exchange rate exhibits a negative effect on exports of agricultural and industrial products. Lotfalipour, Ashena and Zabihi (2013) in their study on Iran using system-GMM estimator found a negative and significant impact of real exchange rate movements on manufacturing investment.

In Nigeria, Adebanjo *et. al*, (2019) adopted Error Correction Model (ECM) and the findings suggested that exchange rate has a negative and significant effect on manufacturing sector in the long-run. In contrast, Otokini, Olokoyo, Okoye and Ejemeyovwi (2018) applying ECM, showed that exchange rate was insignificant in influencing Nigeria's manufacturing output in the long-run. Enekwe, Ordu and Nwoha, (2013), however, adopted multiple regression analysis which confirmed that exchange rate was an important determinant of manufacturing GDP.

Overall, the empirical literature is not unanimous on this currency exchange rate and manufacturing growth nexus for Nigeria which justifies this research to improve the debate. The current study is distinct in capturing of Nigeria's peculiar parallel exchange rate using the exchange rate spread approach. In addition, based on export growth function, price proxied by exchange rate is not the only determining factor of export growth, but income does too, thus, this study includes trade openness to account for income variable and to further substantiate the workability of export model in Nigeria

3. The Methodology

3.1 Data Source, Description and Justification

This study decomposed the data series for the period of Q1 2000 to Q4 2018. Data were obtained from the World Bank and African Development Bank databases as well as the Central Bank of Nigeria (CBN) Statistical Bulletin. Time series data include imported intermediate inputs, exchange rate spread (Naira/US$), trade openness, Africa infrastructure development index for Nigeria, total factor productivity, consumer price index and manufacturing export. Manufacturing export (MEXP) is measured as percentage of merchandize exports classified as semi-finished and finished goods. Imported Intermediate Inputs (III) represents import and refers to products as a result of foreign knowledge and innovation of competing products. Exchange Rate Spread (ERS) is the difference between the official market rate and bureau de change rate (CBN, 2016). Consumer Price Index (CPI) measures the average change in prices over time that consumers pay for a basket of goods and services. Trade Openness (TOP) is obtained by dividing total trade over nominal gross domestic product while Total Factor Productivity (TFP) is measured by the sum of labour force plus capital formation divided by nominal gross domestic product. Africa Infrastructure Development Index (AIDI) for Nigeria is a key indicator that drives productivity and it is based on four major components of transport; electricity, ICT, and water & sanitation and will serve as infrastructure index in this study.

The choice of variables is guided by the GVC framework and other contemporary issues. A priori expectation is that the level of manufacturing exports is expected to be positively related to imported intermediate inputs, trade openness, infrastructure index, total factor productivity while exchange rate spread and consumer price index is expected to exert negative relationship.

3.2 Model

This study adapts the model from the study of Greenaway, Kneller and Zhang, (2010) who investigate the effect of exchange rates on UK manufacturing exports inputs using micro firm-level data. However, this study examines the effect of imported intermediate input and exchange rate movement on manufacturing exports in Nigeria using nationally aggregated time series. This study adopts Vector Error Correction Model (VECM) to investigate the long-run relationship between importation of intermediate input, exchange rate spread and manufacturing export. The suitability of VECM is accentuated by Sim (1980) and Hill, Griffiths and Lim's (2012) argument that it is designed for use with non-stationary series that are known to be co integrated and as well helps to offers a coherent way to combine the long-and short-run effects. The choice of VECM is based on the simple reason that all the variables are stationary at first difference i.e. I(1) and have a long-run cointegration.

In developing the VECM model, three steps were involved. The first step is to identify the lag, followed by Johansen test of cointegration and lastly to carry out the VECM test. Importantly, VEC model can be obtained from the Autoregressive Distributed Lag model (see Zou, 2018) and the scholar further shows how each equation in the VAR model is an autoregressive distributed lag model; as such, it can be regarded that the VEC model is a VAR model with cointegration restrictions. Since there is a cointegration relationship in the VEC model, when there is a large range of short-term dynamic oscillation, VEC expressions can limit long-term conduct of the endogenous variables and be convergent to their cointegration relation. Given the adoption of GVC framework, the functional form of the adopted model is express in equation 1:

$$MEXP = f(III, ERS, TOP,\ AIDI, TFP, CPI) \quad (1)$$

Where; MEXP= Manufacturing Export (%); III = Imported Intermediate Inputs (Billion US$), ERS= Exchange Rate Spread (Naira/US$); TOP = Trade Openness (%), AIDI = Africa Infrastructure Development Index (AIDI) for Nigeria (%), TFP = Total Factor Productivity (%) and CPI = Consumer Price Index (%).

Assuming $y_t = (y_{it}, y_{2t}, \cdots, y_{kt})'$ as k-dimensional stochastic time series, $t = 1,2,\cdots,T$ and $y_t \sim$ I(1), each $y_{it} \sim I(1), i = 1,2,\cdots,k$ is affected by exogenous time series of d-dimension $x_t = (x_{1t}, x_{2t}, \cdots, x_{dt})'$ then the VAR model can be established as follows:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \boldsymbol{B} x_t + \mu_t, t = 1,2,\ldots,T \quad (2)$$

If y_t is not affected by exogenous time series of d-dimension $x_t = (x_{1t}, x_{2t}, \cdots, x_{dt})'$, then the VAR model of formula (1) can be written as follows:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \mu_t, t = 1,2,\ldots,T \quad (3)$$

With cointegration transformation of formula (2), we get

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (4)$$

Where

$$\prod = \sum_{i=1}^{p} A_i - \boldsymbol{I}, \qquad \Gamma_i = -\sum_{j=i+1}^{p} A_j \quad (5)$$

If y_t has cointegration relationship, then $\prod y_{t-1} \sim$ I(0) and formula (4) can be written as follows:

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{i-1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (6)$$

where $\beta' y_{t-1} = ecm_{t-1}$is the error correction term, which reflects long-term equilibrium relationships between variables, and the above formula can be written as follows:

$$\Delta y_t = \alpha ecm_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \mu_t \quad (7)$$

Formula (7) is the vector error correction model (VECM), in which each equation is an error correction model. In other to proceed with the above estimation technique, the study first carried out Augmented Dickey Fuller and Phillips–Perron (PP) unit root tests to determine the level of stationarity of the time series data. For the post-test, the study applied vector autoregressive stability test to ensure that results obtained achieve some level of stability within the study period.

IV. Results and Discussion

Table 1: Descriptive Statistics

	MEXP	III	ERS	TOP	AIDI	TFP	CPI
Mean	2.8888	33.56539	21.53513	0.184551	13.62579	2.276236	113.7672
Median	2.342103	34.1	7.81	0.169225	11.25063	2.253055	95.89
Maximum	6.976888	59.92	150.04	0.457124	23.04956	2.61666	280.537
Minimum	-0.47415	6.14	0.77	-0.05667	8.547375	2.059906	29.72
Std. Dev.	1.892606	17.08485	33.28996	0.188412	5.089697	0.155234	67.04774
Skewness	0.579695	-0.14314	2.344945	0.164195	0.546556	0.50267	0.786565
Kurtosis	2.550595	1.685789	7.923881	1.241135	1.666698	2.173315	2.690508
Jarque-Bera	4.896137	5.728847	146.4256	10.13791	9.41319	5.364701	8.139986
Probability	0.08646	0.057016	0	0.006289	0.009035	0.068402	0.017078
Sum	219.5488	2550.97	1636.67	14.0259	1035.56	172.9939	8646.304
Sum Sq. Dev.	268.647	21891.9	83116.62	2.662442	1942.876	1.807324	337155
Observations	76	76	76	76	76	76	76

Source: *Extract from E-view Output*

Table 1 show that all the variables have a positive mean. The maximum MEXP rate is 6.97% while the minimum is -0.47%. The maximum growth rate of III is 59.92%, whiles the minimum is 6.14%. The maximum ERS is 150.04%, whiles the minimum is 0.77%. The maximum TOP growth rate is 0.46%, whiles the minimum is-0.06%. The maximum AIDI growth rate is 23.05%, whiles the minimum is8.55%. The maximum TFP growth rate is 2.61%, whiles the minimum is2.05%. The maximum CPI growth rate is 280.54%, whiles the minimum is29.72%. Manufacturing export, imported intermediate inputs, infrastructural development and CPI exhibit uniform value and less than proportional while exchange rate spread and trade openness exhibits moderate volatility. Most variables were positively skewed, while the imported intermediated input is negatively skewed, which implies that the negatively skewed variable has more falls than rises and vice- versa. All the variables have kurtoses value less than 3, which validate the property of normally distributed variables. The Jarque-Bera for MEXP, III, ERS, TOP, AIDI, TFP and CPI demonstrated that the data was normally distributed; that is, the null hypothesis that the variables are not normally distributed was rejected.

Table 2: Summary of Stationarity Test Results

Variables	Augmented Dickey Fuller		Phillips–Perron			
	Level	1st Diff	Level	1st Diff	Decision	Order of Integration
MEXP	-2.573422	-3.771434***	-2.498336	-5.164032***	Non	I(1)
III	-1.332793	-5.458610***	-2.166983	-4.831371***	Stationary	I(1)
ERS	-1.725600	-7.971944***	-1.689414	-8.050568***	at level	I(1)
TOP	-1.423468	-4.526331***	-1.565336	-4.114443***	but	I(1)
AIDI	-0.739682	-4.118161***	1.709522	-3.712145***	stationary	I(1)
TFP	-1.781581	-2.701033*	-1.952378	-3.990070***	at first	I(1)
CPI	-0.980952	-8.237347***	-1.052136	-8.127483***	difference	I(1)

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

Source: *Extract from results*

The result on Table 2 reveals that all variables of MEXP, III, ERS, TOP, AIDI, TFP and CPI exhibit non-stationarity at level [that is, I(0)]. To make our data stationary for all variables in our model we perform the Unit Root Test at first difference and check for stationarity and the results reveal that all the series were stationary at first difference [that is, I (1)]. At this point, the variables in the model are ready for cointegration tests and this is presented in Table 3.

Table 3: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-158.01	NA	2.31	4.58	4.80	4.67
1	612.37	1369.60	4.61	-15.45	-13.68*	-14.75
2	691.73	125.65*	2.06*	-16.30*	-12.98	-14.98*
3	727.83	50.15	3.25	-15.94	-11.07	-14.00
4	768.40	48.45	5.00	-15.71	-9.29	-13.15

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: *Extract from results*

The major requirement in conducting Johansen (1992, 1995) co-integration tests and estimation of a VAR function - either in its unrestricted or restricted Vector Error Correction (VEC) framework - is the choice of an optimal lag length. And the choice of an optimal lag length depends on multivariate versions of information criteria, which include the LR, AIC, HQ, FPE and SICS (Brooks, 2002). The optimal lag of 2 is chosen for the empirical model based on LR, AIC, HQ and FPE. Table 4 presents the Johansen co-integration test results for the specified export models applying the trace and maximum eigen value test statistics. The upper column of Table 4 holds the trace test, while the bottom column holds the maximum eigen value test.

Table 4: Cointegration Test based on Johansen's Maximum Likelihood Method

Null Hypothesis	Alternative Hypothesis			Critical Values	
λ_{trac} rank test		Eigen values	λ_{trac} rank test	0.05%	P_values
H_o: r = 0	H_1: r = 0	0.4996	156.7301***	125.6154	0.0002
H_o: r = 1	H_1: r = 1	0.3658	106.1954***	95.7537	0.0079
H_o: r = 2	H_1: r = 2	0.3173	72.9531**	69.8189	0.0275
H_o: r = 3	H_1: r = 3	0.2647	45.0881	47.8561	0.0889
H_o: r = 4	H_1: r = 4	0.1876	22.6445	29.7971	0.2640
H_o: r = 5	H_1: r = 5	0.0923	7.4751	15.4947	0.5231
H_o: r = 6	H_1: r = 6	0.0055	0.4051	3.8415	0.5245
λ_{max} rank test			λ_{max} rank test		
H_o: r = 0	H_1: r > 0	0.4996	50.5347**	46.2314	0.0163
H_o: r $\leq$1	H_1: r > 1	0.3658	33.2423	40.0776	0.2398
H_o: r $\leq$2	H_1: r > 2	0.3173	27.8650	33.8769	0.2198
H_o: r $\leq$3	H_1: r > 3	0.2647	22.4436	27.5843	0.1985
H_o: r $\leq$4	H_1: r > 4	0.1876	15.1694	21.1316	0.2772
H_o: r $\leq$5	H_1: r > 5	0.0923	7.0700	14.2646	0.4809
H_o: r $\leq$6	H_1: r > 6	0.0055	0.4051	3.8415	0.5245

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Both Trace and Max-eigenvalue test indicates 3 and 1 cointegrating eqn(s) at the 0.05 level
Source: *Extract from results*

Based on the stationary linear combination, the study explores the direction and significance of imported intermediate inputs on manufacturing export under the role of dual exchange rate regime using Vector Error Correction Method Model. Table 5 and 6 presents the results of the model:

Table 5: Normalized Cointegrating Coefficients (Long-Run Elasticity)

	MEXP	III %	ERS %	TOP %	AIDI %	TFP %	CPI %
Normalized Coefficients	1.0000	-0.681860	-1.343265	8.509612	-0.239563	73.66127	23.23778
Standard Error		0.95778	0.33791	1.82947	0.17067	18.0302	5.78571

Source: *Extract from results*

Table 5 which is an extract from Appendix I presents the estimates of the VECM model. Though the theoretical nature of this model does not allow meaningful explanation of the VECM estimates, the study relies on the impulse response functions and forecast error variance decompositions for insightful interpretation as recommended by Sim (1980) in Balcilar, Roubaud, Usman, and Wohar (2020). However, estimates of the results reveal that exchange rate spread, trade openness, total factor productivity and consumer price index affect the manufacturing export positively; the imported intermediate inputs and Africa infrastructure development index affect manufacturing export negatively. Each percentage-point increase in exchange rate spread will cause the decrease of 1.34% point in MEXP. Only the variable of ERS is statistically and theoretically significant while III exhibit positive sign and statistically insignificant.

Table 6: Vector Error Correction Model Prediction Results

Error Correction	D(MEXP) %	D(III) %	D(ERS) %	D(TOP) %	D(AIDI) %	D(TFP)%	D(CPI) %
CointEq1	-0.3244	-2.56E-03	0.1689	0.0044	0.01512	0.00045	-0.0079
	(0.0837)	(0.0084)	(0.0671)	(0.0049)	(0.0186)	(0.0004)	(0.0021)
	[-3.8761]	[-0.0031]	[2.5155]	[0.8964]	[0.8129]	[1.1276]	[-3.7287]

Source: *Extract from results*

The estimated VECM without any restrictions as shown in Table 6 and indicate that unlike imported intermediate inputs, trade openness, infrastructure development and total factor productivity; the manufacturing export, exchange rate spread and CPI congregate to their long-run equilibrium given the co integrating equations. This implies that only the variables of MEXP, ERS and CPI that are statistically significant while III, TOP, AIDI and TFP are not significant. Importantly, the result of the short-run dynamic coefficients associated with the long-run relationships obtained from the VECM equation is given in Table 6. A value of (-0.32) for the VECM coefficients suggests that a fast speed of adjustment strategy of roughly 32%. This means that approximately 32% of discrepancy the previous quarters is adjusted for the current quarters. The results of impulse response and variance decomposition are presented on Table 8 and 9.

For diagnostic test, Figure 1 shows the AR Roots Graph, which confirms that model is stable while Table 7 failed to ascertained serial correlation.

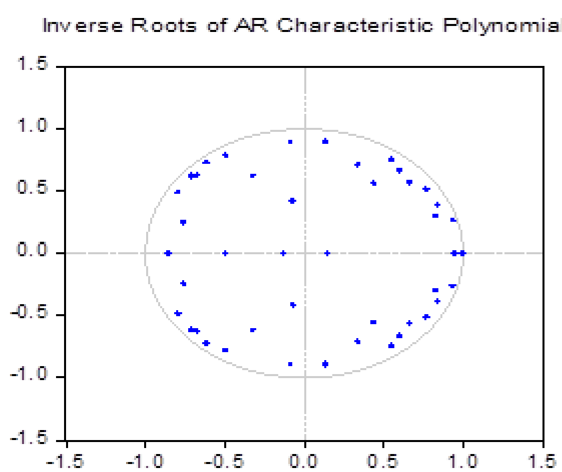

Figure 1: Inverse Roots of AR Characteristic Polynomial

Table 7: VEC Residual Heteroskedasticity Tests (Levels and Squares)

Joint test:		
Chi-sq	Df	Prob.
77,774.89	840	0.95

Table 8: The Impulse Response

Period	MEXP %	III %	ERS %	TOP %	AIDI %	TFP %	CPI %
2	1.053935	-0.020000	0.192210	-0.080312	0.097660	-0.056800	-0.105281
6	0.894126	-0.255116	0.501785	-0.450846	0.282692	-0.125293	-0.313158
10	0.818660	-0.420902	0.447958	-0.589320	0.048027	-0.294395	-0.164388

Source: *Extract from results*

Table 8 and Figure 2 holds the impulse response and further reveal that manufacturing export responds contemporaneously to its own shock and maintains positive responses through the horizons. The results also suggest that a shock in the imported intermediate inputs will have declining response on manufacturing export, which does not support the widely held hypothesis that importing leads to export expansion. This finding is contrary to the previous findings for non-Nigeria studies (Olper, *et. al*, 2017; Feng, *et. al*,2016; Habiyaremye,2015; Adeoti,2012, Greenaway, *et. al*, 2010) and Nigeria's studies by Ogbonna (2015), Iyoboyi and Na-Allah (2014) and Arawomo (2014). However, two possibilities may account for the explanation of import of intermediate inputs not improving manufacturing exports. First, when the import cost is high due to underlying currency cost and tariff, it may be the case that importing-firms are paying higher prices for inputs as result of exchange rate volatility (Manova & Zhang, 2012). Second is the concern about the quality of imported inputs. The use of lower quality inputs of foreign origin to produced required tradable goods at the international market has a relatively negative impact on export productivity (Bas & Strauss-Kahn, 2015).

The results however confirm positive response of manufacturing export to exchange rate spread shock in all the time horizons. While this finding differs with the evidence of Hunegnaw (2017), Pamommast, *et. al*, (2013), Lotfalipour, *et. al*, (2013) and Adebanjo, *et. al,* (2019) that exchange rate volatility causes a reduction in the volume of exports, consistent with the J curve effects, the estimated result agrees with the previous findings of Otokini, *et. al*, (2018), and Enekwe, *et. al*, (2013) in Nigeria. This supports the non-conventional theoretical view that increase exchange rate volatility does not only represent a risk, but equally provides greater profit prospect which might drive exports growth. It, however, depends on the capacity of the firms to alter their factor inputs to benefit from changes in exchange rate with or without adjustment costs to optimize higher prices conditions (Nguyen & Duong, 2019). The results also suggest that a shock in the imported intermediate inputs will have declining responses on manufacturing export, which does not support the widely held hypothesis that importing leads to export expansion.

Table 8 and Figure 2 further reveal the responses of TOP responds to MEXP shock negatively over the study period and statistically insignificant. This implies that Nigeria's economic integration is insignificant to spur manufacturing export output. AIDI respond to MEXP shock positively throughout the time horizon and the response is statistically significant across the horizon. The significant is a pointer to reinvigorate the development of critical infrastructure. TFP responds to MEXP shock negatively over the period and the response is statistically insignificant which is contrary to a priori expectation about the role of human capital to manufacturing sector growth. Finally, CPI responds to MEXP shock negatively and is insignificant, which is in line with theoretical postulation.

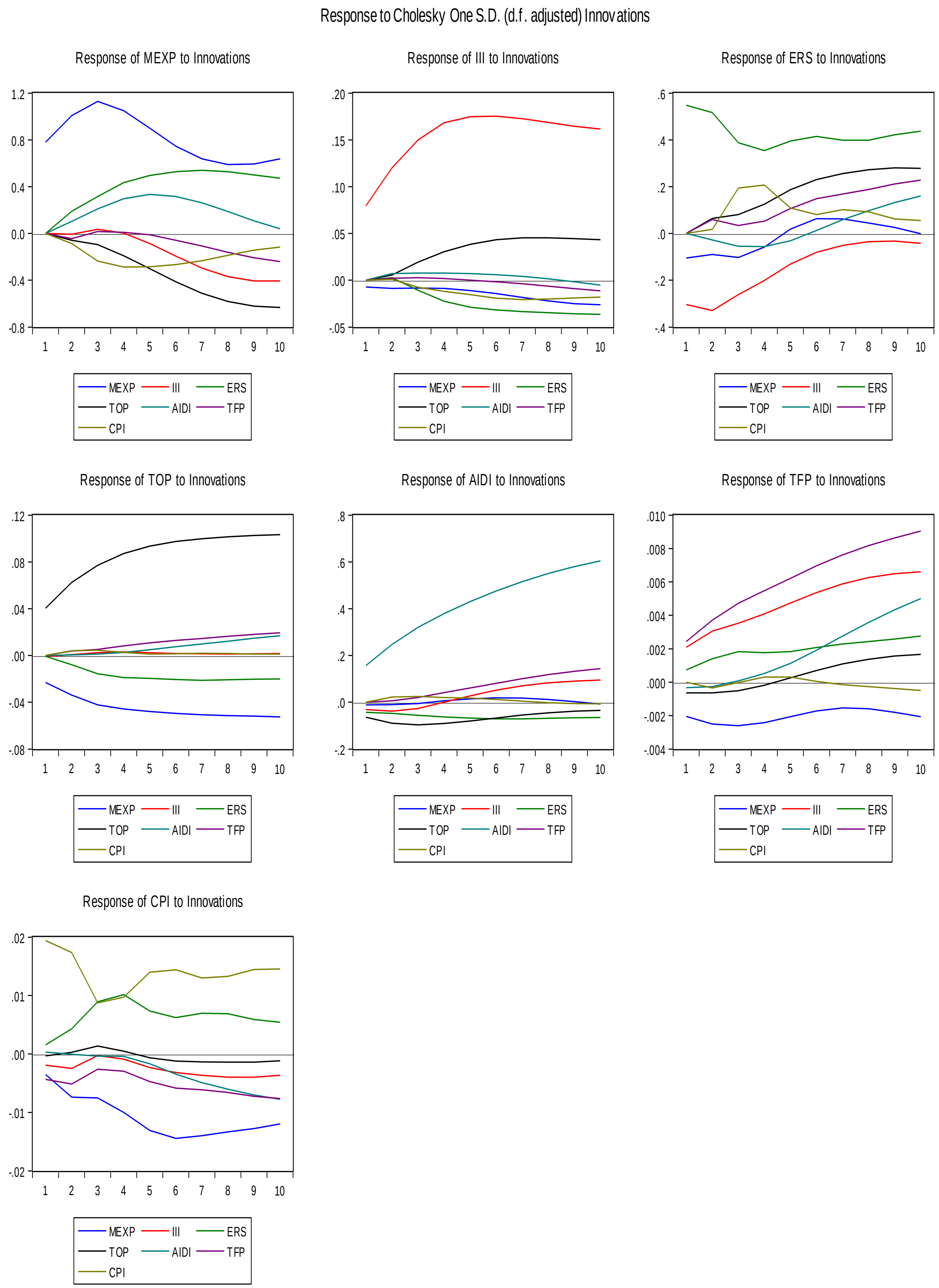

Fig 2: Graphical Representation of the Impulse Responses

Table 9: *Variance Decompositions*

Period	MEXP %	III %	ERS %	TOP %	AIDI %	TFP %	CPI %
2	96.27	0.02	2.04	0.35	0.52	0.18	0.61
6	75.97	1.06	9.61	4.90	3.41	0.29	4.76
10	62.15	5.16	12.05	11.94	2.68	1.88	4.13

Source: *Extract from results*

Table 9 presents the variance decomposition of the response of manufacturing export to its own shock as well as shocks arising from imported intermediate inputs and exchange rate spread. In the short-run to the future (quarter 2 to 10), manufacturing exports show strong influence on itself while the other variables in the model including imported intermediate inputs, exchange rate spread or volatility (uncertainty), trade openness, infrastructure index, total factor productivity and consumer price index have strong exogeneity i.e. they do not have strong influence on manufacturing exports. Finally, it is observed that the contribution of MEXP to own shock is 62.15% (which is the largest), followed by contributions from ERS, TOP, III, CPI, AIDI and TFP shocks of 12.05%, 11.94%, 5.16%, 4.13%, 2.68% and 1.88% respectively

V. Conclusion and Policy Recommendations

This study examined the direction and significance of import of intermediate inputs on manufacturing export in Nigeria under the dual role of exchange rate regime for the period of Q12000 to Q42018. The study employed the Vector Error Correction. The Johansen cointegration test is used to established long-run relationship of the variables while the impulse responses and variance decomposition function was applied to find the direction of causality and statistical significance. Results suggest a long-run cointegration of imported intermediate inputs, exchange rate spread on manufacturing exports in Nigeria. However, the direction using impulse response shows the existence of a negative and insignificant response of imported intermediate inputs on manufacturing export, and this is contrary to earlier position of Veblen (1915) and later Solow, (1956) while using exchange rate spread, the results indicate exchange rate volatility positively and significantly respond to the export volume. The results of variance decomposition show that in addition to own shocks, between 5 to 12 per cent of the variation in manufacturing export is due to shocks in imported intermediate inputs and exchange rate spread respectively.

Some vital policy implications are drawn from these findings. Firstly, for the Central Bank of Nigeria, working towards the unification of exchange rate to promote transparency and greater trade finance opportunities from global financial markets is the right direction to take policy in order to boost performance of manufacturing exports. As the capacity to manage the cost of imported intermediated inputs largely depend on the exporters' access to external sources of finance as well their capacity to hedge against exchange rate movements (Sharma, 2016). The dual rates limit these hedging capacities for investors. Secondly, implementation of synchronous innovations including continual investment in human capital development, risk hedging infrastructure, and increase funding for research and development to aid intellectual property by the Nigeria government will help improve absorptive capacity of manufacturing exporters (firms) to benefit from technologies through intermediate inputs of foreign origin and enhance competitiveness and productivity of the export subsector. As the results show that the sectors absorptive capacity remains low as seen in imported intermediate inputs, exchange rate spread, trade openness, Nigeria's infrastructure development index, total factor productivity and consumer price index respectively.

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Appendix I

Vector Error Correction Estimates
Date: 05/11/20 Time: 14:38
Sample (adjusted): 12/01/2000 12/01/2018
Included observations: 73 after adjustments
Standard errors in ( )& t-statistics in [ ]

Cointegrating Eq:	CointEq1
MEXP(-1)	1.000000
III(-1)	-0.598827 (1.05691) [-0.56658]
ERS(-1)	-1.405109 (0.37443) [-3.75271]
TOP(-1)	8.730859 (2.00884) [4.34621]
AIDI(-1)	-0.114951 (0.18795) [-0.61161]
TFP(-1)	62.06937 (20.1375) [3.08227]
CPI(-1)	19.32774 (6.47914) [2.98307]
C	-227.2892

Error Correction:	D(MEXP)	D(III)	D(ERS)	D(TOP)	D(AIDI)	D(TFP)	D(CPI)
CointEq1	-0.308349 (0.07758) [-3.97437]	0.000196 (0.00793) [0.02465]	0.171437 (0.06311) [2.71647]	0.003813 (0.00463) [0.82379]	0.011586 (0.01770) [0.65462]	0.000517 (0.00039) [1.31857]	-0.007297 (0.00203) [-3.60238]
D(MEXP(-1))	0.572461 (0.18285) [3.13082]	0.013980 (0.01869) [0.74789]	-0.054646 (0.14874) [-0.36741]	0.003242 (0.01091) [0.29723]	0.033146 (0.04171) [0.79465]	0.000525 (0.00092) [0.56829]	0.001465 (0.00477) [0.30685]
D(MEXP(-2))	0.361032 (0.21623) [1.66965]	-0.010242 (0.02211) [-0.46332]	-0.192878 (0.17589) [-1.09657]	-0.008033 (0.01290) [-0.62271]	-0.001704 (0.04933) [-0.03454]	-2.65E-05 (0.00109) [-0.02425]	0.008774 (0.00565) [1.55414]
D(III(-1))	2.229462 (1.76069) [1.26624]	0.535476 (0.18000) [2.97485]	-1.314124 (1.43222) [-0.91754]	-0.069738 (0.10504) [-0.66394]	0.150461 (0.40165) [0.37460]	0.002652 (0.00890) [0.29803]	0.020233 (0.04597) [0.44015]
D(III(-2))	-0.054565 (1.51965)	-0.001900 (0.15536)	0.293667 (1.23614)	-0.009333 (0.09066)	0.007667 (0.34667)	-0.005206 (0.00768)	0.055538 (0.03968)

	[-0.03591]	[-0.01223]	[0.23757]	[-0.10295]	[0.02212]	[-0.67779]	[1.39981]
D(ERS(-1))	0.006177	0.007758	0.137885	-0.009404	0.042805	0.001456	-0.004498
	(0.17604)	(0.01800)	(0.14320)	(0.01050)	(0.04016)	(0.00089)	(0.00460)
	[0.03509]	[0.43104]	[0.96289]	[-0.89541]	[1.06589]	[1.63656]	[-0.97873]
D(ERS(-2))	-0.213485	-0.029844	-0.085664	-0.007032	-0.005582	0.000571	0.003169
	(0.16634)	(0.01701)	(0.13531)	(0.00992)	(0.03795)	(0.00084)	(0.00434)
	[-1.28344]	[-1.75499]	[-0.63311]	[-0.70866]	[-0.14709]	[0.67968]	[0.72963]
D(TOP(-1))	1.744181	0.226871	0.307636	0.555823	0.299462	0.005052	0.064340
	(2.86295)	(0.29269)	(2.32883)	(0.17079)	(0.65310)	(0.01447)	(0.07475)
	[0.60923]	[0.77513]	[0.13210]	[3.25436]	[0.45852]	[0.34918]	[0.86077]
D(TOP(-2))	2.541544	0.044260	-1.846845	0.031699	0.015000	-0.001170	0.073994
	(3.15350)	(0.32239)	(2.56518)	(0.18813)	(0.71938)	(0.01594)	(0.08233)
	[0.80594]	[0.13729]	[-0.71997]	[0.16850]	[0.02085]	[-0.07343]	[0.89872]
D(AIDI(-1))	0.567773	0.047957	-0.103696	0.007619	0.583584	0.001550	-0.004057
	(0.64450)	(0.06589)	(0.52426)	(0.03845)	(0.14702)	(0.00326)	(0.01683)
	[0.88096]	[0.72785]	[-0.19780]	[0.19816]	[3.96930]	[0.47597]	[-0.24113]
D(AIDI(-2))	0.160517	-0.061001	-0.148219	-0.007732	0.102962	0.000735	0.003959
	(0.67493)	(0.06900)	(0.54902)	(0.04026)	(0.15397)	(0.00341)	(0.01762)
	[0.23783]	[-0.88407]	[-0.26997]	[-0.19203]	[0.66873]	[0.21550]	[0.22466]
D(TFP(-1))	-7.167612	0.937653	15.50225	1.694043	3.991822	0.454614	-0.061286
	(39.3493)	(4.02279)	(32.0083)	(2.34744)	(8.97647)	(0.19887)	(1.02735)
	[-0.18215]	[0.23309]	[0.48432]	[0.72165]	[0.44470]	[2.28601]	[-0.05966]
D(TFP(-2))	33.56362	-2.020962	-12.94801	-0.995916	0.436478	0.149305	0.576535
	(36.5529)	(3.73691)	(29.7336)	(2.18062)	(8.33855)	(0.18474)	(0.95434)
	[0.91822]	[-0.54081]	[-0.43547]	[-0.45671]	[0.05234]	[0.80821]	[0.60412]
D(CPI(-1))	1.511591	0.051598	-2.383962	0.128752	0.960930	-0.028053	0.034314
	(4.26601)	(0.43613)	(3.47014)	(0.25450)	(0.97317)	(0.02156)	(0.11138)
	[0.35433]	[0.11831]	[-0.68699]	[0.50591]	[0.98742]	[-1.30114]	[0.30809]
D(CPI(-2))	-2.543701	-0.499963	6.792340	-0.069693	-0.534552	0.014063	-0.352801
	(4.23390)	(0.43284)	(3.44402)	(0.25258)	(0.96585)	(0.02140)	(0.11054)
	[-0.60079]	[-1.15507]	[1.97221]	[-0.27592]	[-0.55345]	[0.65724]	[-3.19161]
C	0.069785	0.018303	-0.031377	0.006960	0.080010	-0.002750	0.040937
	(0.29388)	(0.03004)	(0.23905)	(0.01753)	(0.06704)	(0.00149)	(0.00767)
	[0.23746]	[0.60920]	[-0.13126]	[0.39698]	[1.19346]	[-1.85171]	[5.33545]
R-squared	0.581812	0.490113	0.328933	0.338385	0.520477	0.510333	0.346124
Adj. R-squared	0.419132	0.329616	0.226020	0.164275	0.394287	0.381474	0.174051
Sum sq. resids	34.74148	0.363103	22.98787	0.123642	1.807947	0.000887	0.023681
S.E. equation	0.780705	0.079814	0.635056	0.046574	0.178097	0.003946	0.020383
F-statistic	3.347002	2.430658	1.128234	1.943519	4.124542	3.960381	2.011500
Log likelihood	-76.48034	89.99631	-61.40703	129.3177	31.40425	309.5139	189.6411
Akaike AIC	2.533708	-2.027296	2.120741	-3.104594	-0.422034	-8.041477	-4.757290
Schwarz SC	3.035727	-1.525278	2.622759	-2.602576	0.079984	-7.539458	-4.255272
Mean dependent	0.030818	0.022176	0.016797	0.000251	0.197884	-0.007188	0.029116
S.D. dependent	0.883482	0.090933	0.643483	0.050946	0.228835	0.005017	0.022428

Determinant resid covariance (dof adj.)	1.05E-16
Determinant resid covariance	1.85E-17
Log likelihood	681.1469
Akaike information criterion	-15.40128
Schwarz criterion	-11.66752
Number of coefficients	119