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Exchange Rate Volatility and Import Substitution in Nigeria: A Sectoral Analysis

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ABSTRACT: *The study attempts to estimate the impact of exchange rate volatility on import substitution in Nigeria. The study establishes that the volatility in exchange rate has a detrimental effect in the agricultural sector in the short run, but this normalizes in the long run, thus having a positive permanent effect. Similarly, the empirical results depict that the demand for the consumer goods sector was negatively affected by exchange rate shocks in the initial stage, but over the periods had a positive effect. The result of the food sector, however, conforms with the apriori expectation that currency exchange rates have a significant impact on food prices. Food prices are likely to respond as the Naira weakens or strengthens vis a visother currency.This study provides empirical evidence to drive policy formulation in the management of the country' foreign exchange rate as it impacts on trade of goods and services, andprovides information that may guide more studies on the subject.*

Keywords: Exchange rate volatility; Import substitution; Agricultural sector; GARCH; Vector autoregression

JEL Codes: C50; N50; Q17.

I. INTRODUCTION

The term "import substitution," which refers to the process by which a country reduces its reliance on foreign suppliers by increasing its domestic production of manufactured products, is both descriptive and prescriptive. Import substitution is a by-product of an expanding economy, which is different from the belief that import restrictions might stimulate growth.As a result, the goal of import substitution is not to lessen imports overall but rather to alter the proportion of capital goods to consumer goods.

The stability of a country's exchange rate, among other macroeconomic prices, is important to the development of the domestic economy. Given that no country possesses absolute productivity advantage in a given value chain, acquisitions of components involve exchanging the domestic currency with trade partners' currencies, unless there is some currency swap agreement in place that allows any of the parties to use their domestic currency in exchange for the goods from the trade partner to the extent of the total value of the currency swap agreement in the local currency of the importer. The theoretical underpinning of import substitution itself has been assumed to be largely in support of developed countries and skewed against the developing countries in that the conventional case for free trade was anchored on the perfect competitive market structure, a static model with neoclassical assumptions that are incompatible with developing countries. To put in perspective, the theory of comparative advantage impliesthat developing nations would be locked in a disadvantageous pattern of specialization and trade, since they can onlyexport primary commodities which command paltry foreign exchange earnings in exchange for manufactured goods that levy high foreign exchange costs; thus, keeping the developing nations perpetually in a poverty loop (Irwin, 2020).

However, it is our considered viewthat while the import substitution policy may help preserve a nation's scarce foreign exchange earnings, such a policy is unlikely to improve the nation's foreign exchange position. It thus stands to reason that import substitution policy ought not to be a long-term target but a stop-gap policy towards a more economically improving export promotion policy. This is more so, in that import substitution only allows for the substitution of imported goods for the domestically produced ones. Of course, this in itself is not bad, but foreign exchange generation must be prioritized otherwise, the country may descend towards a state of autarky, which is not sustainable in either the short or long run.

Furthermore, a nation considering import substitution or export promotion policy ought to also consider its own degree of competitive advantages in producing those import-substituted goods vis-à-vis thecosts of production, consumption (economic) capacity of its populace, and production know-how. For developing

nations like Nigeria where policy continuity by successive governments is a challenge, it is important that such economic policy be backed by some legislative act or legally codified for consistent execution and sustainability.

Economists have expressed support for import substitution industrial policies for a number of reasons, especially, considering the low-income elasticity of demand for raw materials or primary goods that are usually the source of export for developing countries which is susceptible to price volatility and subsequently, short term revenue uncertainty (Prebisch, 1984; Jayanthakumaran, 2000).This is in contrast to the finished goods produced by advanced economies with high income elasticity of demand and premium market prices. This disparity in technology, know-how, and implied value proposition along the stages of production is what had been the major source of balance of payment disequlibrium in developing countries, and subsequently, exchange rate volatility, due to suboptimal foreign exchange acretion to external reserves, hence, constituting a challenge to central banks in defending their respective local currency.

It is pertinent, however, that the above factors are without bias to other theoretical factors like terms of trade, inflation and interest rates differentials as identified by Davis & Lim (2010).Furthermore, these empirical factors are in most cases, tilted against developing countries. For Nigeria, exchange rate volatility has given rise to demand management and devaluation in a bid by the Central Bank to correct the attendant distruptions in the country's external balance that has often tilted the terms of trade in favour of the country's trading partners.

A cursory examination of the literature indicates that previous research in the subject area has focused mainly on imports (consumption). However, import substitution or export promotion (production) in Nigeria has received very little attention.This gap in the literature makes this paper relatively novel in contributing to literature and filling some of the gaps in this area.

Subsequently, the primary objective of this research work is to investigate the nexus (if any) between the Naira's exchange rate volatility (wide variability in the naira exchange rate) and import substitution (export promotion) in Nigeria across different sectors of the economy. The paper examines whether import substitution could help decelerate the wide variability in the country's exchange rate, particularlyagainst the United States dollar.

In the empirical section, the authors estimate the impact of exchange rate volatility on import substitution using a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) and the Vector Autoregression (VAR) models. The variables incorporated in the empirical models include exchange rate volatility, inflation, output gap, consumer import and export, agricultural produce import and export, capital importation and exportation, food import and export, consumer goods import and export, and manufactured goods import and export.

Trade Gap is defined as the ratio of import to export. If Trade Gap <1 import substitution or export promotion is said to be taking place, but if Trade Gap > 1, import substitution or export promotion is not taking place.

This paper is divided into five (5) sections. Following the introduction, section 2 reviews relevant literature for the purpose of identifying existing gaps, while section 3 discusses relevant data and methodology. In Section 4, the empirical results are presented and dicussed while Section 5 concludes and proffers policy recommendations.

II. REVIEW OF RELEVANT LITERATURE

Trading of goods and services across countries of the world involves the use of an exchange platform for trade. Currency "Exchange Rate" invariably plays a vital role in providing ways to equate prices in various economies. As Flood and Gather (2000) noted, the demand and supply of commodities across the globe has led to fluctuations (volatility) in the exchange rates of countries of the world. The real exchange rate is one of the essential indicators of an economy's international competitiveness, and therefore, has a strong impact on a country's foreign trade development. It is commonly believed that movementsin the real effective exchange rate influence exports and imports.

The traditional school of thought espoused by Clark (1973), attempted to explain the effect of exchange rate volatility on international trade. It maintained that volatility raises trade risk and, as a result, reduces trade flows. Early research on this topic concentrated on how firms behaved and assumed that higher exchange rate volatility would raise the earning uncertainty on foreign currency-denominated contracts. As a result, international trade would decline to levels lower than it normally would without exchange rate fluctuations.

There is, however, a growing consensus in the literature which maintained that sustained and significant exchange rate volatility can result in serious macroeconomic disruptions, thatrequire both currency devaluation and demand management strategies in order to correct external imbalances. The central intuition is that an increase in exchange rate volatility leads to increased uncertainty, which may have a negative impact on trade flows (De Grauwe (1988), and Delleas & Zilberfarb (1993).

More importantly, it is imperative to note that, there are only a few studies that investigated the impact of exchange rate volatility on import demand as most have focusedmore on exports[1]. Trade flows may be unaffected by exchange rate volatility if financial institutions and credit opportunities hedge future price uncertainty associated with the volatility (Baron 1976, and Giovannini 1988).

Theoretical perspectives on the exchange rate volatilities and trade nexus are inconsistent, with some findings having support for negative relationships, some others have purported positive nexus, while others have claimed neutral results. However, recent empirical research has concentrated on identifying the nature of these relationships. For instance, Kamal and Kadir (2005) conducted a study for Pakistan using Engel Granger and cointegration for the period 1981-2003 to determine the linkages between real exchange rates, imports, and exports in the long and short term. They found that the country's trade is strongly influenced by the exchange rate of that country. They concluded that the exchange rate plays a vital role in determining the competitiveness of a country in world trade.

For sectoralcommodity analysis, Chandan and Debdatta (2019) conducted a study on the impact of currency rate volatility on India's imports by using a balanced panel of 73 goods for the years 2013 to 2016. Instead of using cross-country bilateral import flows, they used disaggregated trade data to examine the linkage at the commodity level. In order to estimate exchange rate volatility, the GARCH model was chosen. Their findings confirmed that, for all commodities, a 100% increase in volatility causes a long-term 12% decline in India's imports. However, there is evidence of a strong short-term dampening effect of exchange rate fluctuation on imports. Disaggregated data shows that imports in the agriculture and related sectors are substantially more sensitive to exchange rate volatility than imports in other sectors like the manufacturing sector.

Import substitution scenarios abound in the theory of economic development, (Corporaso, 1980; Palma, 1978 and Bruton, 1989). The Stolper-Samuelson theorem justifies the importance of import substitution in the area of foreign exchange savings, emphasizing that funds that could have been used for the importation of goods is rather saved. Noting that the cost of importing raw materials, technology etc. may be high in the short run, the aggregate amount of foreign exchange saved in the long run justifies embarking on an Import substitution strategy (Leamer, 1996 and Deardorff, Stern, and Baru, 1994).

Considering the effect of exchange rate volatility on sectoral trade performances in Latin America and the Caribbean;Wang and Barret (2007), Bahmani-Oskoee and Wang (2008), and Bahmani-Oskoee, Ardalani, and Bolhasani (2010) demonstrated that the effect of exchange rate volatility on trade varies from industries to industries. Using Import penetration to capture import substitution, Moreira et al. (2017) found that a 1% increase in the local currency depreciation reduces the Import Penetration by 0.41% to 0.69% and varies in those sectors.

For Nigeria, there have been several research works that seek to empirically analyse the nexus between exchange rate volatility and trade flows (import & export). For example, Aliyu (2010) adopted the Vector Error Correction (VEC) and the Vector Autoregressive (VAR) model to analyse the impact of exchange rate volatility on Nigeria’s non-oil exports from 1986Q1 to 2006Q4. He established long-run negative relationship between Naira exchange rate volatility and non-oil exports in Nigeria. In the alternative, the result was positive for the US Dollar exchange rate volatility and non-oil exports.

According to literature, exchange rate volatility can affect imports in either a positive or negative way, however Dickson (2012)'s research work provided evidence on the influence of real exchange rate volatility on Nigeria's imports using the co-integration test. According to the findings, Nigeria's imports are not significantly impacted by actual exchange rate fluctuation. This demonstrates that domestic consumption is heavily biased toward imported goods, further demonstrating the high import component of Nigerian exports.

Joseph (2011) used the GARCH model on annual time series data of trade flows in Nigeria from 1970 to 2009. This study indicated that a negative and statistically insignificant transmission existed between exchange rate volatility and aggregate trade. The result, however, proved consistency with the work of Aliyu (2010). Using annual time series data from 1970 to 2010, Dickson and Ukavwe (2013) used the Error Correction and GARCH model to examine the effect of exchange rate fluctuations on trade variations in Nigeria. The study's findings demonstrated that exchange rate volatility was statistically significant and helpful in explaining differences in exports, but not in explaining variations in imports.

Okwuchukwu (2015) examined the long-run and short-run impacts of real exchange rate volatility and the level of economic growth on international trade in Nigeria using a Vector Error Correction Model (VECM) on time series annual data covering the period 1971 to 2012. The results revealed that in both short-run and long-run, exports and imports were majorly influenced by the real exchange rate. The findings further revealed that exchange rate volatility depressed exports and imports in the long run.A glance through the literature on the effects of exchange rate uncertainty on the trade flows within African countries, Bahmani-Oskooee &Arize

[1] See, for example, Ascher (1996), Alacevich (2011), and Alacevich and Boianovsky (2018). Without specific focus on import substitution, Anne Krueger (1995, 1997) captures several topics explored here.

(2019) consider the response of exports and imports of 13 African nations to a (GARCH)-based measure of exchange rate uncertainty and found significant long-run effects of exchange rate uncertainty on trade flows of almost all countries. These effects were asymmetric in nature.

For developing economies such as Croatia and Cyprus, Serenis and Tsounis (2014) examined the effect of volatility on the countries' aggregate exports during the period 1990 to 2012 employing the ARDL methodology and the results suggested that there is a positive effect of volatility on exports. Ozturk and Kalyoncu (2009) used quarterly data of six (6) countries from the period 1980 - 2005 to investigate the impact of exchange rate volatility on trade flows in each of the countries, applying an Engle- Granger residual-based co-integration technique. The result showed a significant negative effect on trade in South Korea, Pakistan, Poland and South Africa and a positive impact on Turkey and Hungary. Mukherjee & Pozo (2011) studied the impact of exchange rate volatility on the volume of bilateral trade using a Gravity model from a sample of 200 countries and the result indicated a negative relationship although at a very high level of volatility, the effect diminishes and eventually becomes statistically indistinguishable from zero.

Dell'Aricccia (1999) as well carried out an investigation on the European Union on the relationship between exchange rate fluctuations and trade flows using the gravity model and panel data from Western Europe. Evidence showed a negative effect of exchange rate volatility on international trade. Arise et al (2000) applied the Johansen's co-integration procedure and ECM to detect a negative effect of real exchange rate volatility on export. Quarterly data spanning from 1973 to 1996 on thirteen (13) Less Developed Countries (LDCs) were used in the analysis. The result revealed that an increase in REER resulted in a significant negative effect on export demand in each of the thirteen (13) countries in both short and long-run. Kasman and Kasman (2005) used quarterly data spanning from 1982 to 2001 and applied cointegration and Error correction model to investigate the impact of real exchange rate volatility on Turkey's export to its major trading partners. Exchange rate volatility exhibited significant positive effect on export volume in the long run.

Dickson and Ukavwe (2013), using annual time series data from 1970 to 2010 employed the Error Correction and GARCH model to look into how changes in the exchange rate affected changes in commerce in Nigeria. The study's findings demonstrated that while exchange rate volatility is not statistically significant and positively significant in accounting for changes in imports, it is statistically significant and negatively significant in accounting for variations in export.In general, there are evidence of mixed results in establishing the nexus between exchange movements and trade flows (export & import). While, some supported positive relationships, others have established negative relationships. Studies that resulted in a significant positive relationship between exchange rate and trade variable(s) could be seen in the works of Aliyu (2010); Kasman and Kasman (2005); among others. The case of ambiguous relationship between these two variables is evident in Arestotelous (2001); Tenreyo (2007), etc.

3.1 Sample Data: Types and Sources

This research utilizes monthly data for Nigeria covering January 2004 - December 2021 to analyze the impact of exchange rate volatility on import substitution, using a sectoral analysis. The data was gathered from various issues of the Central Bank of Nigeria's Statistical Bulletin, World Bank database, and the National Bureau of Statistics database. The availability of data for the variables included in the empirical model determined the time period under examination.

Table 1

3.2 Definition and Measurement of the Variables[2]

Variable	Definition	Source
Agric_imp[1]	Argic imports (USD)	World Integrated Trade solution
Agric_exp	Argic Exports (USD)	World Integrated Trade solution
Capital_imp	Capital Imports (USD)	World Integrated Trade solution
Capital_exp	Capital Exports (USD)	World Integrated Trade solution
Consumer good_imp	Consumer good imports (USD)	World Integrated Trade solution
Consumer good_exp	Consumer good Exports (USD)	World Integrated Trade solution
Food_exp	Food Exports (USD)	World Integrated Trade solution
Food_imp	Food Imports (USD)	World Integrated Trade solution
Intermediate_goodImp	Intermediate goods imports (USD)	World Integrated Trade solution
Intermediate_good_exp	Intermediate good exports	World Integrated Trade solution

[2]Dummy variables were used to capture effect

If Trade Gap >= 1= dummy =1; if trade Gap <1 dummy =0

Manufactured_imp	Manufactured goods Imports	World Integrated Trade solution
Maufactured_exp	Manufactured good exports	World Integrated Trade solution
Exchange Premium	Difference between Official and BDC rate	CBN
Output Gap	Difference between the actual output and its potential. Estimates generated using HP filter	Nigerian Bureau of Statistics
Inflation	Headline inflation	National Bureau of Statistics (NBS)
Extr_vol	Exchange rate Volatility	Computed using GARCH process.
Data length and type	2004-2021(Monthly)	

3.3: Empirical Model Specification and Empirical Research Design

Capturing exchange rate volatility

Following the work of Dickson (2012) to capture exchange rate volatility, we employ the use of a GARCH model. The GARCH (m, s) is the Generalized ARCH by Bollerslev (1986) model and has been applied in various branches ofeconometrics, especially in financial time series analysis.

$$\boldsymbol{\sigma_t{}^2 = \alpha_0 + \sum_{i=1}^{m} \alpha_i \varepsilon^2{}_{t-i} + \sum_{j=1}^{s} \beta_j \sigma^2{}_{t-j}; \varepsilon_t \sim N(0,1); \alpha_0 > 0; \alpha_1 \geq 0; \beta_j \geq 0}$$

The variance equation $\sigma^2{}_t$is composed of three terms: the mean (long term average)$\alpha_0$news about volatility from the previous period (the ARCH term) .α_i^2 and the GARCH term $\sigma^2{}_{t-j}$.It is the weighted average of the variance a, the ARCH term, and the GARCH term.

3.3.1: Empirical Model Specification

This research employs the workhorse multivariate time series model, popularly known as VAR, to analyze the main research objective, using the general form of the model specified below:

$A(L)Y_t = \varepsilon_t$ (1)

Where A(L) represents the path order matrix polynomial in the lag operator, L; to the extent that $A(L) = A_0 - A_1L - A_2L^2 - A_nL^p - \cdots - A_nL^{\cdot}$ whereA_0 = non-singular matrix normalized to 1 on the diagonal and explains the contemporaneous relationships between the endogenous variables in the $n\ x\ 1$ vector Y_t, ε_t in an $n\ x\ 1$ vector of structural disturbances. In association with this, the reduced form VAR is estimated as

$\beta(L)Y_t = \mu_t$ (2)

Where $\beta(L)Y_t$ is an n[th] order matrix polynomial in the lag operator L; μ_t is an $n\ x\ 1$ vector of reduced form disturbances.

Relationships between Eq (1) and Eq (2) could be expressed as follows:

$\beta(L) = A_0^{-1}A(L) = I - \beta_1L - \beta_2L^2 - \cdots - \beta_nL^n$ (3)

And $\mu_t = A_0^{-1}\varepsilon_t$ or $\varepsilon_t = X_0\mu_t$ (4)

Our VAR model comprises of a vector of five endogenous variables, $IMPS_t = (EXR_t, Ouput_t, INF_t,)$, where $IMPS_t$ denotes the import substitution measure; EXR_t denotes exchange rate volatility,$Ouput_t$ represents the computed output gap; and INF_t denotes the rate of inflation. The choice of the explanatory variables enables the evaluation of the extent to which exchange rate volatility affects import substitution across specific sectors of the Nigerian economy namely the agricultural, consumer goods and food sectors.

3.3.2: Empirical Research Design

We begin the time series analysis by carrying out stationarity tests. Arguably, the stationarity of a time series variable(s) has significant impact on its features and behaviour, and in recent years, unit root testing in time series econometric modelling has become increasingly popular. In order to avoid misleading results, variables in regression models must be evaluated for the presence (or absence) of unit root. Estimations in the presence of unit root produce biased results. Unit root testing uses an autoregressive model to determine whether or not a time series variable is non-stationary.

All the time series variables in the empirical model are tested for stationarity using the Augmented-Dickey fuller method. The presence (or absence) of unit root is tested in both level and first difference of all the variables in each of the time series models (see Table 4.1).

Following unit root testing, we proceed to investigate whether cointegration (a long run relationship) exists among the variables in the time series model. Testing for cointegration is, in some ways, a need for verifying that empirical model estimations yield relevant and unbiased results (Gujarati, 2013). We employed the

Johansen method to test for cointegration. The Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC) are used to identify an acceptable lag length for the cointegration test statistic.
Following the stationarity and cointegration testing, the paper proceeds with estimating the VAR model. The VAR modelling technique, which is one of the most popular, adaptable and straightforward methods for multivariate time series analysis has been adopted for this study. The VAR model is utilized for structural inference and policy analysis, and is proven to be particularly beneficial for forecasting and understanding the dynamic behaviour of economics and financial time series. In structural analysis, certain assumptions regarding the casual structure of the data under examination are enforced, and the consequent causal implications of unexpected shocks or innovations to specified variables on the model variables are described. Impulse response functions and forecast error variance decomposition are commonly used to summarize these causal effects.

3.4.1: Summary Statistics

The summary statistics for all the variables used in the analysis are presented in Table 3.1 below.
Table 2: ***Summary Statistics of Monthly Data for the Period 2004 M01 to 2021 M12***

	AGRIC_IMP	ARGRIC_EXP	CAPITAL_IMP	CONSUMERGOODS_EXP	CONSUMERGOODS_IMP	CPAITAL_EXP	FOOD_EXP	FOOD_IMP	INTERMDIATEGOODS_IMP
Mean	38768.96749	117656.8199	1054931.357	654040.4415	1095312.532	82952.12822	84248.10096	183144.3645	773207.5999
Standard Error	3412.684599	16359.08383	23248.28746	42074.93403	28210.21904	5095.452107	6526.077111	10859.95083	13790.24881
Median	26834.2054	11439.84203	943596.9868	412353.6631	1115083.155	51098.12485	48839.42597	146563.0682	712123.1168
Standard Deviation	50156.01553	240428.4483	341678.65	618372.716	414603.853	74887.54602	95913.35366	159608.029	202674.438
Sample Variance	2515625893	57805838739	1.16744E+11	3.82385E+11	1.71896E+11	5608144549	9199371411	25474722910	41076927837
Kurtosis	8.27872497	4.298913609	-0.889205368	-0.061695707	-0.303775493	0.230581864	4.863993391	8.043603465	-0.367830759
Skewness	2.964981101	2.370738805	0.532754183	1.146734595	0.082994549	0.976866269	2.217891466	2.83582441	0.209674138
Range	244583.3389	929288.585	1155382.505	2071876.566	1779731.147	315891.143	432796.4793	820064.9209	819207.4237
Minimum	-4181.893098	-3830.28907	525108.3519	17324.21679	319947.8337	-34490.81502	-5018.415233	1940.778117	356329.4478
Maximum	240401.4458	925458.296	1680490.857	2089200.783	2099678.98	281400.328	427778.064	822005.699	1175536.871
Sum	8374096.979	25413873.09	227865173.1	141272735.4	236587506.9	17917659.7	18197589.81	39559182.73	167012841.6
Count	216	216	216	216	216	216	216	216	216

	INTERMEDIATEGOODS_EXP	MANUFACTURES_EXP	MANUFACTURES_IMP	TEXTILES_EXP	TEXTILES_IMP	Exchange rate Premium	Output Gap	Inflation
Mean	198281.0786	278288.8624	2172259.171	15477.30935	57904.99193	32.9637037	0.21742018	11.86536377
Standard Error	12855.08566	14636.44099	46167.31846	1475.950627	1910.879069	2.931993508	0.182299032	0.252986498
Median	132630.1255	252692.4944	2088628.513	3383.082404	53486.85828	8.22	-0.073993104	12.0526989
Standard Deviation	188930.4029	215110.8724	678518.2381	21691.95554	28084.07208	43.09132814	2.67923765	3.718126987
Sample Variance	35694697123	46272687422	4.60387E+11	470540934.9	788715104.4	1856.862561	7.178314387	13.82446829
Kurtosis	0.186393397	-1.144344636	-1.108954502	1.685056129	0.803289642	2.292791701	-0.755161061	-0.390909255
Skewness	1.161986434	0.360668754	0.182259681	1.5868657	0.943369109	1.608775107	-0.02851683	-0.520603119
Range	634886.1484	688388.0496	2296077.866	92798.02637	128543.0971	189.07	11.02176625	15.20500112
Minimum	6507.745491	-16099.51014	967693.1411	-10568.32744	3858.247052	0.32	-5.320963361	2.88334362
Maximum	641393.8939	672288.5395	3263771.008	82229.69893	132401.3441	189.39	5.700802888	18.08834474
Sum	42828712.98	60110394.28	469207981	3343098.82	12507478.26	7120.16	46.9627588	2562.918574
Count	216	216	216	216	216	216	216	216

IV. DIAGNOSTICS AND ESTIMATION RESULTS

4.1 Presentation of Results

The results are presented below. Table 3 below depicts the log-differenced exchange rate premium. The BDC is the most effective rate, therefore, its deviation from the official rate further depicts the level of fluctuations.

Log Differenced Exchange rate Premium

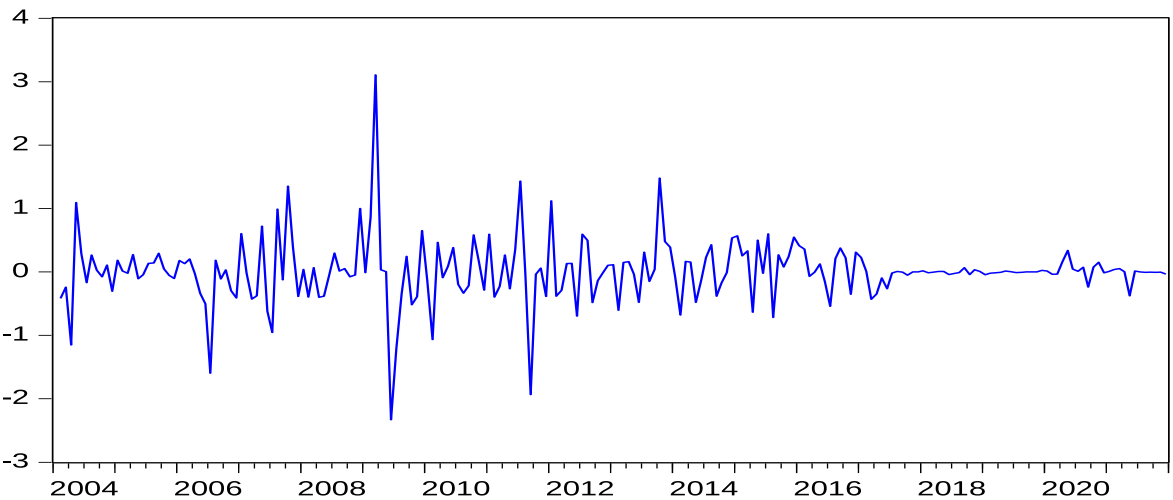


Table 3: Unit Root Test-ADF

Variable	Level	First Difference	Categorization
Agric_imp	-5.393999***	-	I(0)
Agric_exp	-2.390084	-4.142875***	I(1)
Capital_imp	-1.845786	-4.426326***	1(1)
Capital_exp	-2.137605	-5.788684***	I(1)
Consumer good_imp	-1.931929	-4.803798***	I(1)
Consumer good_exp	-1.615353	-4.485242***	I(1)
Food_exp	-1.561143	-5.369969***	I(1)
Food_imp	-1.913567	-5.014417***	I(1)
Intermediate_goodImp	-2.494767	-6.721473***	I(1)
Intermediate_good_exp	-1.154072	-3.182228**	I(1)
Manufactured_imp	-1.684992	-3.971630***	I(1)
Maufactured_exp	-1.920125	-3.930012***	I(1)
Exchange Premium	-13.53775***	-	I(0)
Output Gap	-2.929757	-3.655819**	I(1)
Inflation	-4.185403***	-	I(0)

4.2 The Impact of Exchange Rate Volatility on Import Substitution – With Reference to the Agricultural Sector.

Exchange rate fluctuations affect export prices of a country's agricultural products, the cost of imported inputs, and the agricultural sector's competitiveness. Unless Nigerian agricultural producers accept a lower price for their goods, an appreciation of the Naira will affect the agricultural output by making Nigerian products more expensive for imports. On the other hand, a depreciation of the naira will make agricultural producers more competitive and, in turn, enhance exports. Furthermore, exchange rate volatility will affect the costs of farm inputs such as machinery and insecticides as most agricultural inputs are imported. Exchange rate fluctuations also have a long-term impact on agricultural operations, but the effect can be mitigated by development finance initiatives directed in the agricultural output sector.

The lag length of 4[3] is selected using Akaike Information Criterion. The endogenous variables include ARG for the agriculture sector, EXTRVOL for exchange rate volatility, INFLATION for the rate of inflation and OUTPUT_GAP for output gap. The parameter stability tests confirm that no root lies outside the unit circle and that the VAR satisfies the stability condition. The results are presented below in figure 1:

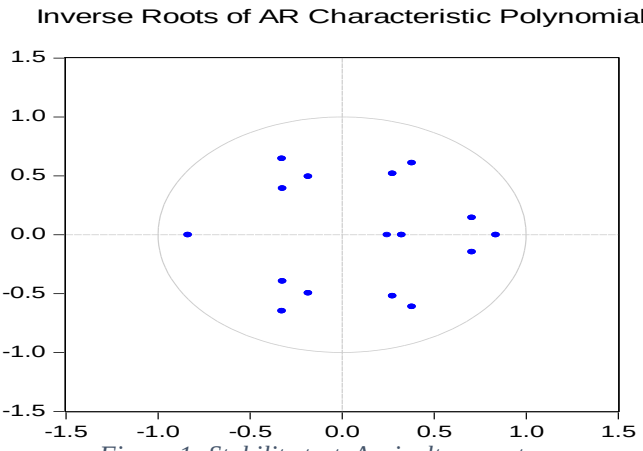
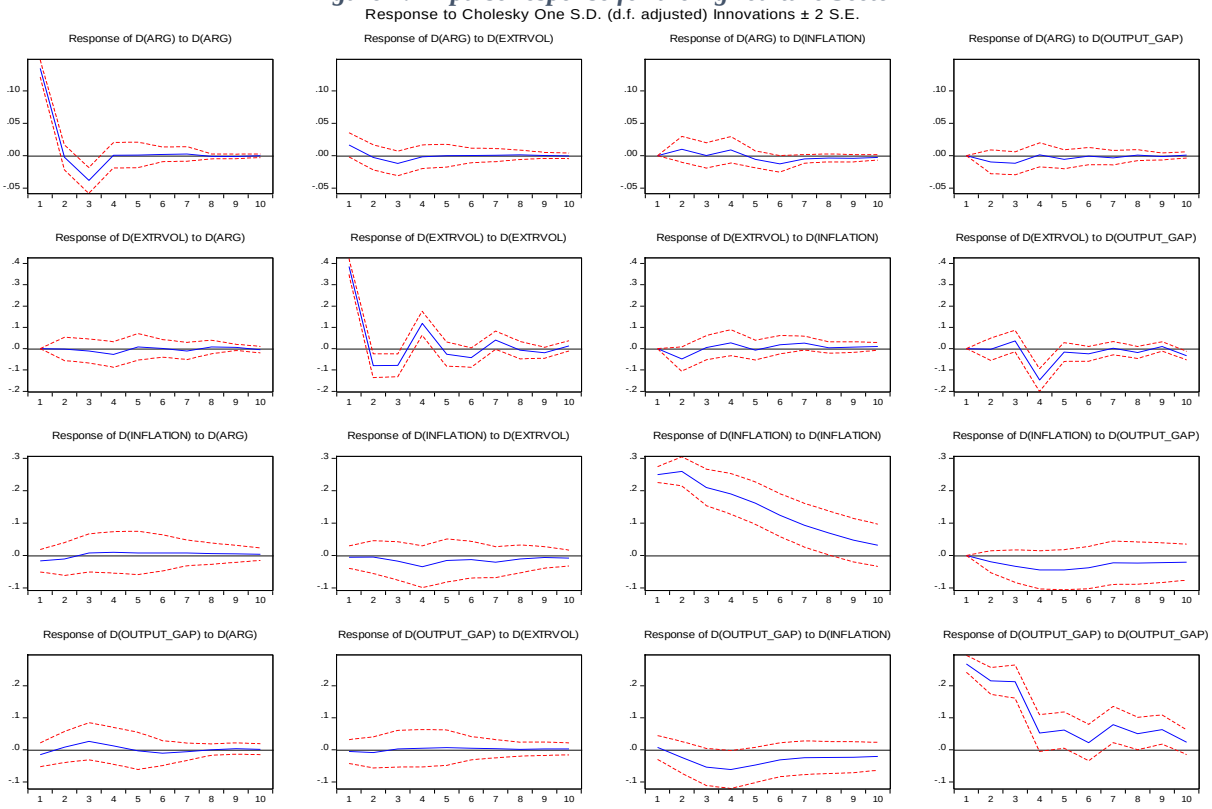


Figure 1: Stability test, Agriculture sector

[3] See Appendix section 2

Figure 2: Impulse response for the Agriculture Sector



For this analysis, the focal point in the Impulse response function is the response of D(ARG) to D(EXTRVOL). It depicts the response of agriculture to a one standard deviation shock to exchange rate volatility. The red dots are the standard error confidence bands. The X axis represents the periods (months), while the Y axis depicts the percentage variation. The blue lines depict the impulse-response function. We capture the response for the 10 periods following exchange rate volatility. From the figure, a one standard deviation shock to exchange rates leads to a fall in agricultural output at the initial stage, although, it remains within the positive terrain in period 1 and falls to the negative terrain in periods 2 and 3. However, the response of agricultural output to exchange rate volatility gradually increases towards the end of period 3, and hits the steady state equilibrium level in the 4th period and beyond. The results indicate that shocks to exchange rate volatility have an initial negative impact on agricultural input; however, there seems to be no change in the long run. Hence, we can conclude that the effect of exchange rate volatility on agricultural output is transitory. This finding is in line with Oye et al (2018) and Iliyasu (2019) who conclude that total agricultural output responds negatively to exchange rate volatility.

Although, exchange rate fluctuations also have a detrimental long-term impact on agricultural operations, the effect may be mitigated by development finance initiatives directed in the agricultural output sector, and this may explain why the response of Nigeria's agricultural output to exchange rate volatility is stable in the long run, as indicated by the empirical results.

4.3 The Impact of Exchange Rate Volatility on Import Substitution – With Reference to the Consumer Goods Sector.

Theoretically, exchange rate fluctuations should have an impact on consumer goods sector. An appreciation of the value of the domestic currency would lead to an increase in the purchasing power of consumers' funds, meaning that consumers may find it cheaper to buy foreign. Conversely, a weaker domestic currency makes imports more expensive. The magnitude of the impact of the exchange rate fluctuation on the domestic economy is a function of whether the country relies more on imports (or not). Furthermore, imported commodities, particularly domestic products that rely on imported parts and raw materials, will vary in value when exchange rates become volatile. A depreciation of the Naira would raise the cost of imports, resulting in cost-push inflation. Depreciation increases the competitiveness of exports. In the long run, this may weaken firms' incentives to cut expenses, resulting in lower productivity and higher pricing.

A lag length of 4 is selected using Akaike Information Criterion[4]. The endogenous variables include CONSU for the consumer goods sector, EXTRVOL for exchange rate volatility, INFLATION for the rate of inflation and OUTPUT_GAP for output gap. The parameter stability tests confirm that no root lies outside the unit circle and that the VAR satisfies the stability condition. The results are presented below:

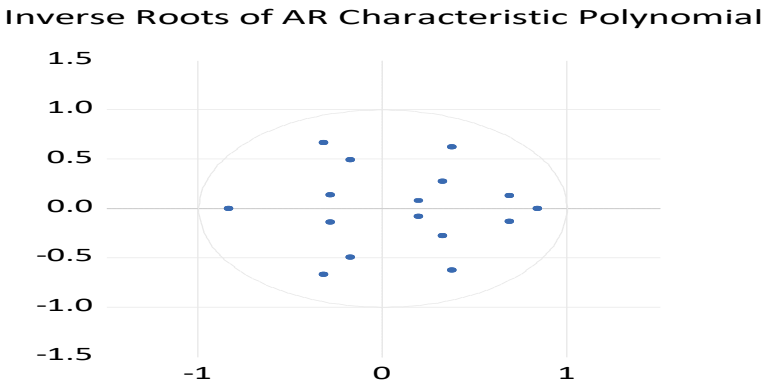
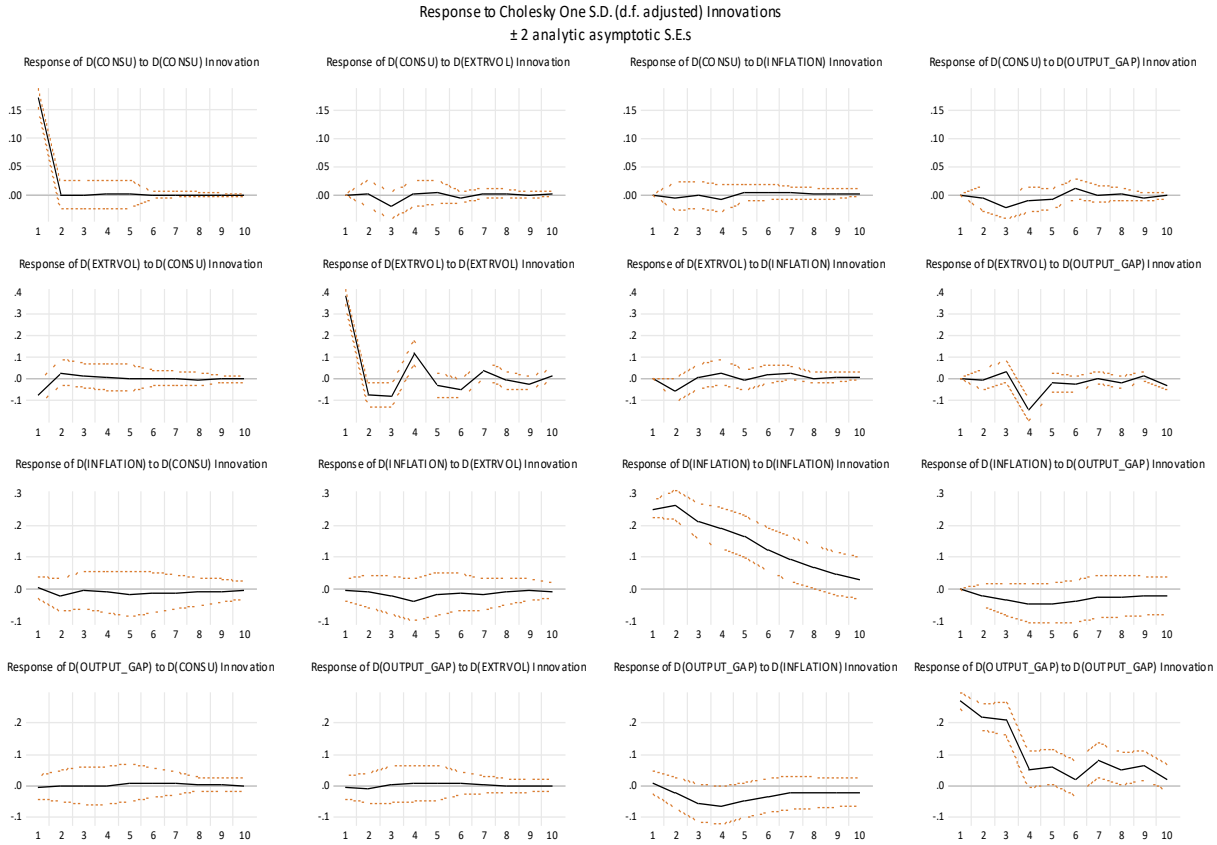


Figure 3: Model stability consumer goods sector

Figure 4: Impulse response Consumer Goods sector



For this analysis, the focal point in the Impulse response function is the response of D(CONSU) to D(EXTRVOL). It depicts the response of the consumer goods sector to innovations in exchange rate volatility, and we capture the response for the initial 10 periods following exchange rate volatility. From the figure, consumer goods sector remains in the steady state in the first two periods following a one standard deviation shock to exchange rates. However, in the third period, the demand for consumer goods falls into the negative

[4] See Appendix for more details

terrain, albeit temporarily, as it picks up rapidly during the fourth period, where it reaches the steady state and remains positive until the tenth period. The results indicate that shocks to exchange rate volatility appears to have a transitory impact on the consumer goods sector.

Arguably, most final products consumed in Nigeria are imported, for instance, electronics and vehicles and due to the fact that the demand for such products is inelastic in nature, it is expected that changes in the naira exchange rate would have an much less detrimental impact on the demand for consumer goods.

4.3 The Impact of Exchange Rate Volatility on Import Substitution – With Reference to the Food Sector.

The food industry is affected by currency exchange rates. When the Naira appreciates, the price of food imported into Nigeria decreases, and vice versa.

For the purpose of our estimations, we select a lag length of 7 based on the Akaike Information Criterion5. The endogenous variables include FOOD for the food sector, EXTRVOL for exchange rate volatility, INFLATION for the rate of inflation and OUTPUT_GAP for output gap. The parameter stability tests confirm that no root lies outside the unit circle and that the VAR satisfies the stability condition. The results are presented below in figure 5:

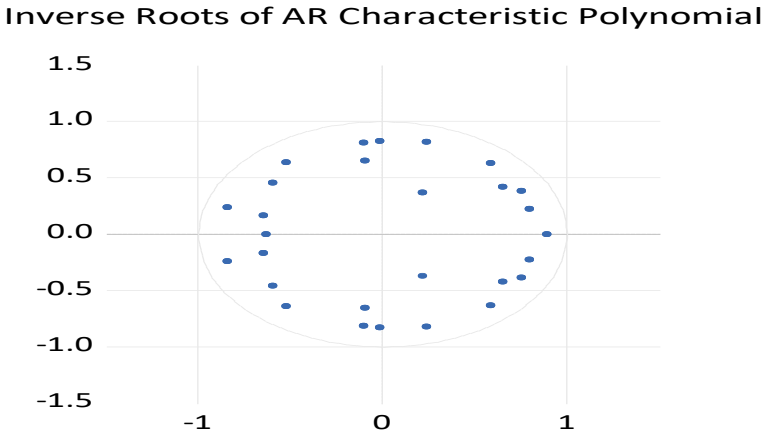
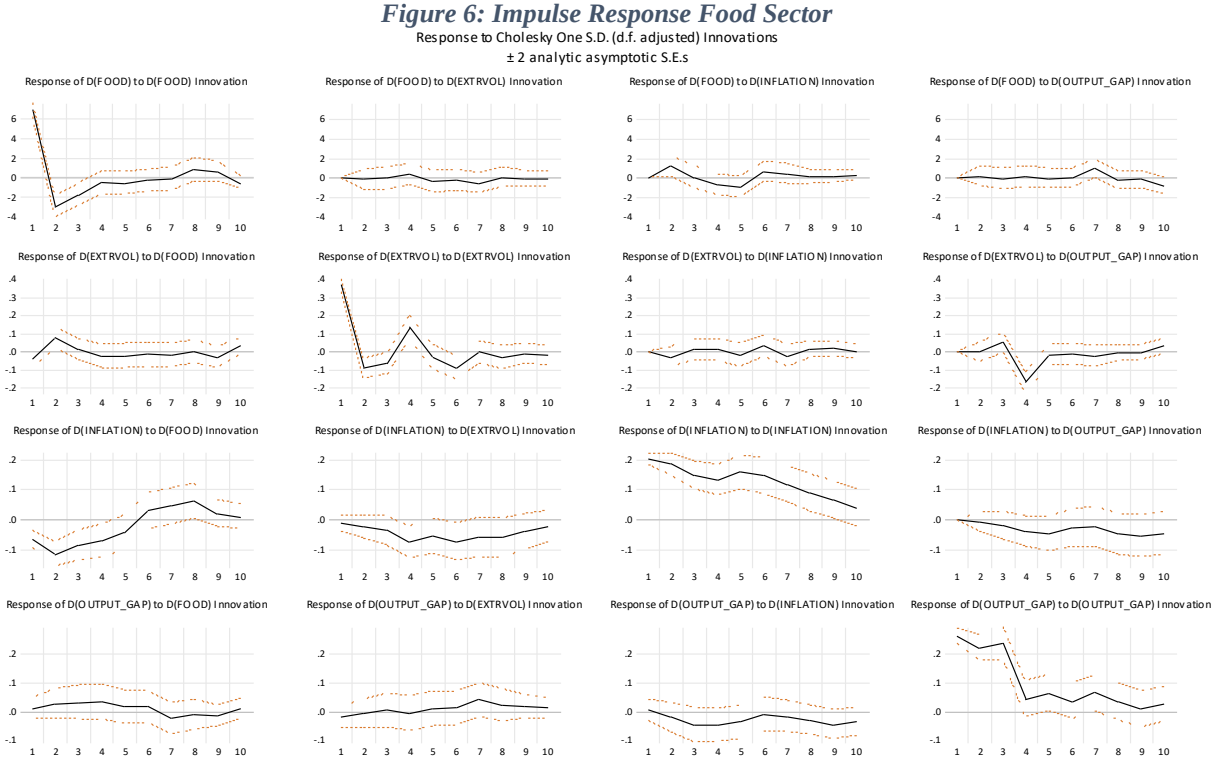


Figure 5: Stability Test Food Sector

Figure 6: Impulse Response Food Sector



[5] See Appendix

We focus on the impulse response of D(FOOD) to D(EXTRVOL). It depicts the response of the food sector to innovations in exchange rate volatility, and we capture the response for the initial 10 periods following exchange rate volatility. From the figure, the food sector remains in the steady state during the initial first three periods following a one standard deviation shock to exchange rates. However, during the fourth period, it rises above equilibrium, then sharply falls below the steady state during the fifth to eight periods then hits the steady state equilibrium in the eight period and beyond. The results indicate that shocks to exchange rate volatility have had asymmetric impact on the food sector both in the short and long run. This finding is in line with a priori expectations - because most foods are traded on worldwide markets, currency exchange rates have a significant impact on food prices. Food prices are likely to respond as the Naira weakens or strengthens against other currencies.

V. POLICY IMPLICATIONS

5.1 Exchange rate volatility on the Agricultural Sector

Exchange rate volatility is expected to affect the Agricultural sector through costs of farm inputs such as machinery and insecticides as most agricultural inputs used in Nigeria are imported. As a result of these, high cost of cultivations is passed to the final consumers, resulting to hike in food inflation. Food inflation comprises the volatile components of the Consumer Price Index, thus spikes in inflationary pressures.

From the results of the analysis, the volatility in exchange rate is established to have a detrimental effect in the short run, but, however, the impact subsides and normalizes in the long run. These positive transitory effects can be attributable to the sustained implementation of the of the Central Bank of Nigeria (CBN) development finance initiatives directed in the agricultural output sector, and this may explain why the response of Nigeria's agricultural output to exchange rate volatility is stable in the long run, as indicated by the empirical results.

In addition, the Federal Government Fiscal policies of boosting the agricultural inputs by removal of levies/duties on the importations of Agricultural implements/machineries are also yielding some results.

5.2 Exchange Rate Volatility and the Consumer Goods Sector

It has been theoretically established that, fluctuations in exchange rate negatively impacts on the consumer goods sector, more severe for an import dependent economy that particularly rely on the importation of domestic products and raw materials. Cost of these imports will vary in value when exchange rates become volatile. A depreciation of the Naira would raise the cost of imports, resulting in cost-push inflation. The empirical results depict that, the demand for consumer goods sector remained negatively affected by exchange rate in the initial stage following shock to exchange rates. But, remained positive, however, after which, the demand becomes stable. Similar to the Agriculture Sector, the results indicate that shocks to exchange rate volatility appears to have a transitory impact on the consumer goods sector.

5.3 Exchange Rate Volatility and the Food Sector

The food industry is mostly affected by fluctuations in currency exchange. When the Naira appreciates, the price of food imported into Nigeria decreases, and vice versa (Imported inflation). From the result, it can be established that, the food sector remains in the steady state during the initial periods to shock in exchange rates and remained stable above the equilibrium in most of the later periods. The results, however, indicate that shocks to exchange rate volatility have had asymmetric impact on the food sector both in the short and long run. This result conforms with the apriori expectation that currency exchange rates have a significant impact on food prices. Food prices are likely to respond as the Naira weakens or strengthens against other currencies, especially for developing economies such as Nigeria that imports about 60 per cent of it food consumables.

VI. CONCLUSION

Countries have to be involved in trading of good and services with one and another across countries, thus involving the use of an exchange platform for exchange. Currency "Exchange Rate" invariably plays a vital role in providing ways to compare prices in various economies. But due to inter play between the demand and supply of goods and services across the countries involves in trade has led to the issues of fluctuations in the exchange rate which have serious consequences for growth and eternal stability/balances of the economy. The study attempts to estimate the impact of exchange rate volatility on import substitutions using a Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) and the Vector Auto-regression (VAR) model. Imports bases are however, categorized into three components viz: the Agricultural sector, Consumer goods sector and The Food Sector.

The study established that, the volatility in exchange rate has a detrimental effect in the Agricultural sector in the short run, but normalizes in the long run, thus having a positive transitory effect. For the Consumer goods sector, similar to the Agricultural sector, the empirical results depict that, the demand for consumer goods sector was negatively affected by exchange rate shocks in the initial stage, but over the periods having a positive effect. The result of the Food sector, however, conforms with the apriori expectation that currency exchange rates have a significant impact on food prices. Food prices are likely to respond as the Naira weakens or

strengthens against other currencies. We provide empirical evidence to drive policy formulation in the management of exchange rate as it impacts on trade of goods and services and provide information that could guide more studies on the subject.

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