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EXCHANGE RATE FLUCTUATION AND NON-OIL IMPORTS IN NIGERIA: AN ARDL BOUNDS TEST APPROACH

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ABSTRACT: ***Since the adoption of the Structural Adjustment Programme (SAP), the exchange rate of the naira has continued to decrease without being stable. Despite the decreasing values of the exchange rate (in real terms), the nation's imports, especially non-oil imports seem to have remained relatively non-responsive to exchange rate changes. This study investigates the impact of exchange rate fluctuations on Nigeria's non-oil imports. Data on non-oil imports, exchange rate and real gross domestic product for the period 1981 to 2018 were sourced from the 2018 Statistical Bulletin of the Central Bank of Nigeria. The ordinary least square regression was adopted for the empirical analysis of the study. Results from the Augmented Dickey-Fuller unit root test reveal that exchange rate fluctuation was stationary at level, while real GDP and Non-oil Imports became stationary after their first difference. Results of the ARDL bounds test show that there is a long-run relationship between the variables as the Wald F-statistics value of 7.391753 is greater than the 5 percent upper bound critical value of 4.35. The long-run coefficient result shows that real exchange rate fluctuation has a significant negative impact on non-oil import in the long-run. A one percent increase in exchange rate, reduces non-oil imports by 12 percent in the long-run. The study therefore concludes that exchange rate devaluation curbs the level of imports in Nigeria and recommends amongst others that the exchange rate be devalued occasionally and that the government should place ban on the importation of goods that are not necessity goods.***

Keywords: Exchange rate fluctuation, non-oil imports, real gross domestic product.

INTRODUCTION

Mankiw (2007) in one of his ten principles of economics opines that international trade benefits all. This notion stern from the argument of the classical economist David Ricardo, who postulates that, the exchange of goods between countries on the basis of comparative advantage would benefit trading partners more, as countries are enjoined to produce those goods in which they are endowed in order to minimize the cost of producing such goods (Oloyede and Essi, 2017). Goods produced by different countries are exchanged during international trade at a common price known as exchange rate. Yang and Zeng (2014) defines exchange rate as the price of a currency in terms of another currency. Conventionally, it is defined as the relative price levels between two countries, rather than how much the currency can purchase in real terms.

Exchange rate is an important relative price that determines and directs the flow of international trade. It is critical in determining the volume of imports and exports of a country during international trade. Just as changes in local prices have implications for the demand and supply of goods within a domestic economy, changes in exchange rates have implications for

the demand and supply of goods across international borders. Theoretically, lower exchange rate (depreciation or devaluation) makes exports cheaper and imports expensive (Nyamrunda & Mbogela, 2014). As the value of local currency falls viz a viz its foreign counterpart, locally produced goods become attractive to foreign consumers as their prices become cheaper. On the other hand, demand for foreign goods falls as their prices become very high for local consumers (Khaled, 2016).

In 1986, Nigeria embarked on an economic reform under the Structural Adjustment Programme (SAP). One of the objectives of the economic reform as proposed by the International Monetary Fund (IMF) was to diversify the Nigerian economy away from overly dependent on crude oil, to increasing the production of non-oil goods via the private sector of the economy, so as to increase the export base of the country (Oriavwote & Eshenake, 2015). In addition, the devaluation of the nation's currency under SAP was expected to help curb the level of imports in the country. Nigeria's imports as observed by Omojimite and Akpokodje (2010) comprise commodities such as raw materials, capital goods and consumer goods. Capital goods are goods such as machines, equipment, tractors, while consumer goods include beverages, toiletries, tooth picks and medications amongst others.

Since the adoption of the Structural Adjustment Programme (SAP), the exchange rate of naira has continued to decrease in value without being stable. Further devaluation of the naira in 2016 put the official exchange rate at N253.4923 per dollar. It further declined from N305.7901 per dollar in 2017 to N306.0802 per dollar in 2018 (CBN, 2018).

Despite the decreasing values of the exchange rate (in real terms), the nation's imports, especially non-oil imports seem to have remained relatively non-responsive to exchange rate changes. Though non-oil imports declined by 27.14% in 1986, it increased astronomically by 188.23% and 700% in 1987 and 1988 respectively and then declined by 77.72% in 1989. This decline didn't last as its increasing trend continued at an average of 52.36% for the periods 1990 to 1993. There was a decline of 3.29% in 1994, an increase of 397.75% in 1995 and a 33.19% decrease in 1995. Declines continued in 1998 and 1999 as non-oil imports fell by 2.53% and 1.62% respectively. It however picked up in the year 2000 and continued to increase at an average of 28.21% within the years 2000 to 2003. It decline by 0.74 in 2004 but increased by 20.05% and 19.67% in 2005 and 2006 respectively. Non-oil imports continued to grow as it averaged 27.93% within the periods 2007 to 2011. It experienced a decline of 15.72% in 2012 but recovered by 4.59% in 2013 and continued to increase by 18.74% and 12.34% in 2014 and 2015 respectively. It declined by 24.11% in 2016 but later increased by 15.41% in 2017.

Given the fluctuating (decreasing and increasing) status of imports, the question that comes to bear is, how effective has exchange rate devaluation been, in curbing imports in the country? Is there any long-run relationship between exchange rate fluctuation and imports in Nigeria? Does exchange rate fluctuation have any significant short-run or long-run impact on imports in Nigeria? Some studies have been conducted on exchange rate fluctuation and imports in Nigeria. This paper however adopts an ARDL bounds Test approach in examining the effect of exchange rate fluctuation in curbing non-oil imports in Nigeria. In specifics, it examines whether there is a long run relationship between exchange rate fluctuations and non-oil imports in Nigeria, and whether exchange rate fluctuations have any significant short-run or long-run impact on non-oil imports in Nigeria.

This paper is organised in five sections. Section 2 presents the review of related literature while section 3 presents the methodology. Presentation and discussion of results is presented in section 4 while conclusion and recommendations are presented in section 5.

Literature Review

Researchers in time past have tried to investigate the relationship and effect of exchange rate on imports in Nigeria. Some of their findings are presented below:

Ewubare and Merenini (2019) examined how exchange rates affect foreign trade in Nigeria. The study adopted the quasi experimental research design with annual data from the period 1980 – 2014. The variables employed in the study are exchange rate, exports and imports measured in international price level and gross domestic product. The empirical estimates for the study were obtained using the ordinary least square regression, co-integration/ECM and the Granger causality test. The findings show unidirectional causality between the variables; exchange rate variation (EXR) and foreign trade (FOT), as well as gross domestic product (GDP) and foreign trade (FOT). This means that exchange rate variation and gross domestic product granger causes foreign trade, and that exchange rate and gross domestic product are necessary conditions for achieving foreign trade. Thus, exchange rate fluctuation and GDP impact on foreign trade in Nigeria during the period of study. The study therefore recommends a diversification of the Nigerian economy in order to avoid overly dependence on one product and to depress importation.

Given concerns about volatility in exchange rate, Muhia (2018) employed a log-linear multiple regression model, and annual data from 1980-2015, to examine the impact of exchange rate fluctuations on the import and export of Kenyan. The result shows that the volatility in exchange rate has a significant effect on the country's imports and exports. Exchange rate fluctuation has a long run negative effect on Kenyan's exports but has no impact on the country's imports.

Oloyede and Essi (2017) investigated the effects exchange rates have on Nigeria's imports and exports. The study employed monthly data from 1996 to 2015 and a three variable vector auto regression model and Augmented Dickey-Fuller test to test for the stationarity of the variables. The VAR result shows that exchange rates have a positive and insignificant effect on imports while it has a negative and insignificant effect on exports at lag 1 but positive and insignificant effect at lag 2. Exports were also found to affect exchange rates negatively while imports affect exchange rates positively. The study concluded that exchange rate in Nigeria is not affected by the activities of imports and exports; neither does exchange rate affect the volume of imports and exports in Nigeria. The research recommended amongst other that the exportation of non-oil commodities be encouraged through entrepreneurial development and that only necessity goods should be imported into the country.

In another study Faheem-ul-Hussain, Irfan and Muhammad (2017) used linear regression to examine the effect of exchange rate fluctuation on imports and exports of Pakistan. Annual time series data from 1985-2015 was sourced from the Pakistan Bureau of Statistics and World Bank data base. Statistical Package for Social Science 18 was employed for the data analysis. Findings from the research reveal that exchange rate fluctuation is positively and significantly related to Pakistan's export and import.

Okwuckwu (2015) in his study examined how exchange rate trend and its volatility affect imports in Nigeria. Using times series data from 1971-2011, they employed co-

integration and parsimonious error correction model, while adopting the Schwarz and Akaike Information criteria as the basis for the selection of lag lengths. The research revealed that exchange rate trend impacted positively and significantly on Nigeria's imports only in the long run, while exchange rate volatility depressed imports. Findings also reveal that a unidirectional causality flows from exchange rate volatility to imports. The study concluded that exchange rate if not managed properly would further exacerbate exchange rate volatility and hence poor performance of the import sector. To curb this, the study recommended among others, the diversification of the economy in order to promote and support the activities of small and medium scale enterprises.

Using annual data from 1990 to 2011, Nyamrunda and Mbogela (2014) empirically examined if lower exchange rates has long run and short run effects on exports, imports and national output in Tanzania. The results from the vector error correction model estimates reveal that lower exchange rate led to an increase in Tanzania's exports in the long run while its imports have been declining over time. It also revealed that the devalued exchange rate has led to an increase in the national output of the country.

Using data from 1981 to 2012, Wanhui (2014) investigated the effect of China's nominal RMB exchange rate on its economic growth. Following the results of the Augmented Dickey-Fuller unit root test, the co-integration test and the empirical analysis of the econometric model, the paper concluded that exchange rate has a positive impact on China's import and export trade. The study thus recommended that appropriate and relevant measures be taken to prevent a short-term appreciation of the exchange rate as to promote efficiency in the development of foreign trade in China.

Again, Oyovwi (2012) empirically examined how real exchange rate volatility impacts on imports in Nigeria. The stationarity of the variables was tested using the Augmented Dickey-Fuller unit root test, while the Schwarz criterion and Akaike information criterion were used to select the lag length of the parsimonious error correction model. Result from the research show that exchange rate volatility has no significant effect on imports in Nigeria, which implies that devaluation as a policy has not depressed the high level of importation in the country. The study thus recommended stringent measures such as outright ban and quantitative restrictions be adopted to curb pressure on the external sector of the economy.

Omojimite and Akpokodje (2010) in their study investigated the effect of exchange rate reforms on the performance of trade in Nigeria from the period 1986 to 2007 . Findings show that the depreciation of the Nigerian currency occasioned by the reform had a little positive effect on the country's non-oil export. It was also discovered that the exchange rate reforms did not constrain the level of imports as was expected but rather stimulated imports though insignificantly. The study therefore concluded that exchange rate reforms are not sufficient enough to diversify the economy, and to change the structure of imports in the country. It was recommended therefore, that a conducive environment for production and effective infrastructure are key to aiding the achievement of the goals of the exchange rate reforms.

METHODOLOGY

Sources of Data Collection

Due to the nature of the subject under study, data from secondary sources was extensively used. The data series employed in the empirical analysis were sourced from the

Central Bank of Nigeria (CBN) Statistical Bulletin (2018 edition), and relevant Journals. Annual data from the period 1981-2018 was used.

Model Specification

Import demand (*M*) is specified as a function of real exchange rate fluctuation (q) and real domestic income (*Y*). Going by the small country assumption, world supply of imports should be perfectly elastic. In other words, import is demand determined. In a concise manner, the import demand function (non-oil import) is expressed as:

$M = m(E, Y)$ ..... (3.1)

The econometric form of the non-oil imports function is specified as:

$M_t = \alpha_0 - \alpha_1 E_t + \alpha_2 Y_t + U_t$ ..... (3.2)

Where: E = Exchange rate fluctuation

Y = Real gross domestic product

M = Non-oil imports, and

$\frac{\partial M}{\partial E} < 0, \frac{\partial M}{\partial Y} > or < 0$ .....(3.3)

The import function suggests that exchange rate fluctuation discourage or increase imports while domestic income (RGDP) can either improve or discourage imports. As income increases consumers can either demand for more foreign goods or investors can decide to import capital goods (machines and equipment) in order to produce those foreign goods in the local economy.

Estimation Technique

The estimation technique employed in this work is the Auto-Regressive Distributed Lag (ARDL) bounds testing developed by Pesaran, Shin and Smith in 2001. The bounds test technique allows us to estimate the variables whether they are integrated of the same order or of different orders.

The equation estimated is as follow:

$\ln\Delta M_t = \alpha_0 + \alpha_1 \Delta \ln E_t + \alpha_2 \Delta Y_t + U_t$ .....(3.4)

Where In = natural logarithm, α_0 = intercept; α_1 and α_2 = coefficients; M = Non-Oil Imports; Y= Domestic Income (Real GDP); E_t = Real exchange rate fluctuation; U_t = Error term.

In order to obtain robust results, the ARDL approach estimates the following models:

$\Delta \ln M_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta \ln M_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta \ln E_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta \ln Y_{t-i} + \alpha_4 \ln M_{t-1} + \alpha_5 \ln E_{t-1} + \alpha_6 \ln Y_{t-1} + \mu_t$ .....(3.5)

Where In = natural logarithm, α_0 = intercept; Y_t= Domestic Income (Real GDP); M_t = Non-oil Imports; E_t = Real exchange rate fluctuation; μ_t = Error term, Δ is first difference operator and *m* is the optimal lag length.

The first part of the model with α_{1i}, α_{2i}, and α_{3i}, represents the short run dynamics of the model, while the parameters α_4, α_5, and α_6 represent the long run relationship. The null hypothesis of the model is:

H_0: $\alpha_4 = \alpha_5 = \alpha_6 = 0$ (there is no long run relationship)

H_1: $\alpha_4 \neq \alpha_5 \neq \alpha_6 \neq 0$ (there is long run relationship)

If there is evidence of a long-run relationship (co-integration) among the variables, the following long-run models are estimated

$\ln M_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \ln M_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \ln E_{t-i} + \sum_{i=0}^{m} \alpha_i \ln Y_{t-i} + \varepsilon_t$ .....(3.6)

If we find evidence of a long-run relationship, we then estimate the error correction model (ECM), which indicates the speed of adjustment back to long-run equilibrium after a short-run disturbance.

The ARDL specification of the short run dynamics can be derived by constructing an error correction model (ECM) of the form:

$\Delta \ln M_t = \alpha_0 + \beta_1(ECM)_{t-1} + \sum_{i=1}^{m} \alpha_{1i} \Delta \ln M_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta \ln E_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta \ln Y_{t-i} + \varepsilon_t$ …(3.7)

Where, $ECMT_{t-1}$= the error correction term.

PRESENTATION AND DISCUSSION OF RESULTS

Table 4.1: Descriptive Statistic

	NOIMPORTS (M)	RERFLUC (E)	RGDP (Y)
Mean	2357.908	25.13471	32749.95
Median	678.8000	7.620380	22449.41
Maximum	9350.800	323.5261	69023.93
Minimum	5.100000	-5.774461	13779.26
Std. Dev.	3049.872	58.07305	18889.20
Skewness	1.081502	4.006840	0.801592
Kurtosis	2.602259	20.27334	2.141006
Jarque-Bera	7.456706	558.9887	5.099939
Probability	0.024032	0.000000	0.078084
Sum	87242.60	929.9843	1211748.
Sum Sq. Dev.	3.35E+08	121409.2	1.28E+10
Observations	37	37	37

Source: Author's computation (2020)

From the descriptive statistics table, it is evident that Nigeria's non-oil imports recorded an average value of approximately 679 billion naira. The maximum non-oil import was approximately 9351 billion naira, with a minimum value of 5.1 billion naira. Real exchange rate fluctuation on the other hand recorded a mean, median and maximum value of 25.1, 7.6 and 323.5 naira respectively. Real GDP recorded a mean, median and maximum value of 32749.95, 22449.41 and 69023.93 billion naira respectively. The skewness statistics shows that non-oil imports, real exchange rate fluctuation, and real GDP are positively skewed. The Jarque-Bera statistics values of the variables and their corresponding probability values shows that the data set employed for the analysis in this work are trendy or non-stationary. Thus, the Augmented Dickey-Fuller test of stationarity was conducted to test the stationarity status of the variables.

Table 4.2: Augmented Dickey-Fuller unit root test result

Variable	ADF – Statistic Level	ADF – Statistic 1st Difference	Model	5% Critical Values	~I(d)
Log(NOIMPORTS)	-0.966	-7.253	Trend	-2.946	I(1)
RERFLUC	-5.717	-	Trend	-2.946	I(0)
Log(RGDP)	-0.032	-3.340	Trend	-2.946	I(1)

Source: Authors' Computation (2020)

The Augmented Dickey-Fuller unit root test result in table 4.2 above shows that all the variables (except for RERFLUC) for the study are stationary after differencing once. Meaning that, non-oil import and real GDP are stationary of order one (I(1)), while real exchange rate fluctuation is stationary at level, that is, of order I(0). This is a good justification for the use of the Autoregressive Distributive Lag (ARDL) Bounds testing approach. This approach is best suited for the analysis in this study as it gives room for a mixture of order one and zero variables as is seen from the unit-root table.

Below is the result of the ARDL model for the non-oil import equation.

Table 4.3 ARDL Bounds Test Result for Non-oil Import Model

ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	7.391753	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Authors Computation 2020

The result as presented in table 4.3 shows that there is a long-run relationship between non-oil imports, real GDP and real exchange rate fluctuation. This is validated by the Wald F-statistics value of 7.391753 which is greater than the 5 percent upper bound critical value of 4.35. This means that any short-run shock that makes the variables to deviate from their equilibrium position will be rectified in the long-run. But the speed of convergence is determined by the lagged coefficient of Non-oil imports. Thus, the ARDL null hypothesis of no long-run relationships exists is refuted. We proceed to estimate the model and the regression result is presented below:

Table 4.4: Regression Result for non-oil imports equation
Depenent Variable: DLOG(NOIMPORTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(NOIMPORTS(-1))	-1.174528	0.210456	-5.580874	0.0001
DLOG(NOIMPORTS(-2))	-0.841985	0.228774	-3.680428	0.0028
DLOG(NOIMPORTS(-3))	-0.867694	0.232721	-3.728474	0.0025
DLOG(RGDP)	-0.956300	0.361416	-2.645981	0.0139
DLOG(RGDP(-1))	-3.095304	2.187881	-1.414750	0.1806
DLOG(RGDP(-2))	8.212512	2.002903	4.100304	0.0013
DLOG(RGDP(-3))	4.516846	1.799776	2.509671	0.0261
D(RERFLUC)	-0.004550	0.001765	-2.577212	0.0230
D(RERFLUC(-1))	-0.010211	0.003176	-3.214584	0.0068
D(RERFLUC(-2))	-0.010059	0.002503	-4.017932	0.0015
D(RERFLUC(-3))	-0.002756	0.001056	-2.611073	0.0215
C	-5.937180	6.279839	-0.945435	0.3617
LOG(RGDP(-1))	0.636534	0.658992	0.965921	0.3517
RERFLUC(-1)	0.003438	0.004257	0.807419	0.4340
LOG(NOIMPORTS(-1))	-0.194113	0.080027	-2.425585	0.0306

R-squared	0.811533	Mean dependent var	0.214517
Adjusted R-squared	0.536082	S.D. dependent var	0.382739
S.E. of regression	0.260690	Akaike info criterion	0.429591
Sum squared resid	0.883468	Schwarz criterion	1.336565
Log likelihood	12.91176	Hannan-Quinn criter.	0.734760
F-statistic	2.946195	Durbin-Watson stat	2.426906
Prob(F-statistic)	0.025627		

Source: Author's computation 2020

From table 4.3, it is evident that real exchange rate fluctuation has a negative significant impact on Nigeria's non-oil imports in the short-run. This is validated by the value of the coefficient for RERFLUC (-0.004550) and its corresponding probability value of 0.0230 which is less than the 5 percent level of significance. By implication, this means that if Nigeria's real exchange rate fluctuates positively (increases) by 1 percent, her non-oil imports would decrease by approximately 0.4 percent in the short-run. Real GDP as a control variable was seen to have

a negative significant impact on non-oil imports in Nigeria. Its coefficient of -0.956300 and the corresponding probability value of 0.0139 shows that as non-oil imports increases by 1 percent, real GDP decreases by approximately 96 percent. This is a clear indication that a significant amount of Nigeria's national income is spent on non-oil imports, which is a serious leakage to the Nigerian economy.

The lagged coefficient of NOIMPORTS (-0.194113) in table 4.3 is negative and statistically significant as expected. This means that any short-run disturbance that makes the variables to drift away from their equilibrium path will be rectified in the long-run at the speed of 19 percent. Thus, if a short-run fluctuation occurs and the variables drift away from their equilibrium path, they will converge back to equilibrium at the speed of 19 percent.

The adjusted R-squared value of 0.54 shows that the estimated model for non-oil imports has a good fit and that the independent variables employed in the model explains about 54 percent of the overall behavior of non-oil imports. The remaining 46 percent (the unexplained variation) is explained by the stochastic variable or error term in the model. The F-statistic value of 2.95 and its corresponding probability value of 0.03 shows that the overall model is statistically significant, therefore, making it useful for making predictions. The Durbin-Watson statistics value of 2.43 is an indication that the estimated model is free from serial or auto-correlation.

Table 4.5: ARDL Long Run Coefficients
Dependent Variable: LOG(NOIMPORTS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RGDP)	-3.279190	4.115623	-0.796766	0.4399
RER	0.093939	0.048417	1.940196	0.0744
RERFLUC	-0.117709	0.101523	-1.159431	0.0601
C	30.586180	38.767893	0.788956	0.4443

Source: Author's computation 2020.

The ARDL long-run coefficients of the estimated model in table 4.3 as presented in table 4.5 shows that, in the long-run RGDP, and RERFLUC would continue to have negative impacts on Nigeria's non-oil imports. The long-run coefficient result in table 4.5 also shows that RERFLUC has a significant impact on non-oil import in the long-run. This means that positive fluctuations in the long-run would lead to about 12 percent reduction in non-oil imports in Nigeria. By indication, this means that in the long-run, if real exchange rate fluctuates positively (meaning that the naira further loose value against the US dollar), Nigeria's non-oil imports would also decrease by a significant amount.

From the results in table 4.3 and 4.5, it is clear that exchange rate fluctuation has a significant long-run effect on Nigeria's non-oil imports. Therefore, the hypothesis of no long-run relationship exists is rejected and its alternate hypothesis accepted.

CONCLUSION AND RECOMMENDATIONS

The study investigates the effect of exchange rate fluctuation on non-oil imports in Nigeria for the period 1981 – 2018. The stationarity of the variables was tested using the Augmented Dickey-Fuller unit root test. Result of the unit root test showed that real GDP and non-oil imports were stationary after first difference while exchange rate fluctuation was

stationary at level. This informed the research to employ the ARDL bounds test approach since it allows estimates that are integrated of different orders. From the regression estimates, it was revealed that real exchange rate fluctuation has a negative and significant impact on non-oil imports in Nigeria in the long-run. The study therefore concludes that exchange rate fluctuation (devaluation of the currency) engenders reduction of Nigeria's non-oil imports in the long-run.

In view of the above, the study makes the following recommendations in other to further curb the volume of import in the country:

- The exchange rate should be devalued occasionally in order to make foreign goods more expensive for the local consumers. This would force local consumers to reduce demand for foreign goods and source for alternatives with the domestic economy.
- Government should ban the importation of non-necessity goods and allow the importation of necessity goods such as machines, and raw materials needed by local manufacturers for the production of goods and services.
- Micro, small and enterprises should be encouraged and supported as such would help increase the level of productivity in the economy so as to bridge the excess demand on local goods that would occur as a result of the ban on importation.

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