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Do Sanitary and Phyto-Sanitary Measures Impede Nigeria-ECOWAS Exports?

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Abstract

The primary aim of this paper is to examine the impact of technical barriers to trade on trade between ECOWAS and Nigeria. Technical barriers and sanitary and Phytosanitary measures influence trade based on their type, timing, and the specific sector or product they target. The effects of non-tariff measures (NTMs) within ECOWAS are varied; they decrease trade value for some member countries while enhancing it for others. In Nigeria, sanitary and Phytosanitary measures have contributed to the growth of light manufacturing during the study period. For instance, technical barriers tend to have a greater impact on agri-food industries compared to sanitary measures, which are more frequently applied to manufactured goods. The paper employs data from multiple sources to test the PARDL model of trade in the ECOWAS region. The findings indicate that technical barriers influence trade flows and prices but do not disrupt trade in the area studied. The results for sanitary and Phytosanitary measures are mixed, suggesting that careful interpretation is necessary. The paper concludes that quantitative controls, price controls, and financial measures related to both sanitary and technical barriers yield different results depending on the sector, product, timing, and frequency of the policy. It recommends that sanitary measures be applied in the manufacturing sector to enhance intra-African light manufacturing. Additionally, the Nigerian government should implement non-tariff measures that do not risk disrupting agricultural trade within the community.

Keywords: General equilibrium Welfare Disequilibrium International trade Microeconomic impact SPS TBT

JEL Classification: D5, D6, F1, F6,

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1. Introduction

The Economic Community of West African States (ECOWAS) was established in 1975 to

foster economic and political cooperation among the fifteen (15) West African nations. The free trade agreements among the memberstates have led to the removal of trade barriers such as tariffs and quotas and other non-tariff measures (NTMs). Nigeria is one of the members and the largest economy in the region. The economic growth of Nigeria is primarily driven by its exports to other western African countries which contribute significantly to its volume of trade. The total bilateral exports of Nigeria to other ECOWAS members shows that Cote D'Ivoire, Ghana, Senegal, Benin and Togo are the top five export destinations for Nigeria. The literature suggests that some of the NTMs may have unintended consequences on its exports.

The NTMs such as Sanitary and Phytosanitary Measures (SPS) are incessantly rising (Assoua et al., 2022) and the main aim of SPS is protection of the health of humans, plants and animals (Crivelli and Groeschl, 2016). Indirectly, SPS measures may be used as form of trade protection policy and the World Trade Organization (WTO) guides imposition of SPS. The SPS may increase production costs, thereby reducing trade. However, consumer confidence may improve due to meeting quality and safety standards, and thus spur trade. Therefore, the major effects of SPS are the relative cost on domestic, foreign production and consumers' willingness to buy the safer goods at a higher price (Assoua et al., 2022)

The existing literature has thoroughly examined the impacts of both Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT) within the context of regional economic communities. Empirical analyses have yielded varied results regarding the influence of these non-tariff measures on exporting countries. However, there is a paucity of research concerning the implications of SPS and TBT on trade within the Economic Community of West African States (ECOWAS), indicating a significant gap that necessitates comprehensive exploration. This paper aims to address this gap by investigating the effects of SPS and TBT on Nigeria's export activities.

NTMs such as SPS can be used as disguise for trade restriction by countries and imposes

technical and financial requirements such as modernizing production processes, healthy packaging of goods, quality control equipment and storage. The compliance to these requirements needs colossal resources. It has been pointed out that opposing paradigms exist in the empirical literature of the SPS. One paradigm sees the SPS as a barrier to trade, while the other views it as a catalyst. From these two paradigms, three viewpoints can be deduced. The first viewpoint is that the SPS measures are restriction in disguise and hence they are trade-impeding. The second point is that the SPS measures can lead to improved competitiveness and market access, and therefore they are trade-propelling. The third viewpoint sees the SPS measures as neither trade-impeding nor trade-propelling, as their effects depend on such factors as the technological advancement of the exporting countries, the compliance and stringency levels of the SPS, and trade (Assoua et al., 2022).

According to the West African economic block agreement there should be a common market to foster trade liberalization among ECOWAS states. The removal of tariff and non-tariff barriers to free trade among the member-states will help to minimize obstacles associated with trade in the region and thereby spur economic growth. Following WTO agreements, NTMs should be science-based and not restrict trade more than necessary. Most technical measures are also non-discriminatory to both domestic and foreign producers. Nevertheless. research shows that on aggregate, SPS measures, are reducing trade, and increasing prices more than any other group of NTMs, SPS requirements comprises many different subtypes. Consequently, this study addresses the inquiry regarding the impact of sanitary and phytosanitary measures implemented within the Economic Community of West African States (ECOWAS) on Nigeria's export activities. In addition, most ECOWAS countries including Nigeria, import primary commodities and are directly or indirectly affected by the SPS measures. As such, understanding their effects on the flow of trade, diversion or expansion of trade, revenue,

income and welfare is very important. Though a wide range of literature exist on the distributional impact and policy regime change of trade liberalization, very few studies evaluate the trade liberalization policy of the NTMs, ECOWAS CET in Nigeria. This study therefore, analyzes the impact of SPS on Nigerian exports to ECOWAS's countries.

2. Literature review

2.1 Effects of SPS and TBT on trade

The imposition of the NTMs have become an integral part of international trade guidelines and currently determine world trade following drastic cuts in tariff measures by regional and global players. As NTMs vary across types and focus, literature documents some ambiguity regarding their influence on welfare. Although scholars generally agree that reducing tariff measures enhances welfare, empirical results about NTMs are inconsistent and vary. For instance, Cadot and Gourdon (2016) used 65 nations to assess how NTMs affect trade and raise prices. The results from the estimations show non-tariff measures exhibit significant price-raising effects on trade. Shepotylo (2016) studied the effect of NTM (SPS and technical barriers to trade (TBT) on international seafood exports using intensive and extensive margins from 1996 to 2011. The study indicates that the SPS measures exert large increase on extensive margins of export and decrease in intensive margins. While TBTs have a reducing effect on extensive margins and increasing effect on intensive margins. This implies SPS measures positively influence demand for seafood by consumers and increase variable cost of production, whereas TBT measures generally raise fixed cost of production. Similarly, Kalaba, Kirsten and Sacolo (2016) study the effect of non-tariff measures on trade in 10 African nations from 2000 to 2010. The study results provide evidence that countries are increasingly using SPS measures of NTMs to replace declining tariff measures and restrict trade.

Similarly, Hwang and Lim (2017) analyze the performance of NTMs of SPS on international tea trades In Korea. The study outcome reveals that NTMs measures promote the capacity of trade. Orefice (2017) investigated the role of NTMs on welfare and trade in the world nations. The study finds negative effects of SPS and TBT on global trade and welfare. Jafari & Britz (2018) employed computable general equilibrium model to analyze the influence of NTMs on trade and welfare in 22 manufacturing sectors across 10 regions; the European Union, United States, Canada, MERCOSUR economic bloc, China, ASEAN 10, Mediterranean countries, Northern Europe, low-income countries and some members of the OECD. The GTAP data spanned from 1995 to 2010. Findings from the study indicate that NTMs enhance trade and economic welfare across all regions, but especially so for EU and US. Zhou et al. (2018) evaluate the performance of NTMs on trade in China using gravity model. The result confirms a negative linkage among non-tariff measures and trade.

Vakulchuk and Knobel (2018) examined the influence of nontariff barriers on goods traded in the EAEU from 2010-2015. The results from the estimated Haveman and Thursby (1999) disaggregated model reveal an elimination or reduction in non-tariff measures enhances trade growth in the Eurasian nations. Kareem et al. (2018) argued that EU nations employ NTMs as protectionist policies to accelerate trade performance and promote welfare in EU nations at the detriment of African food exporters that trade with them. Kinzius et al. (2019) estimate the effect of nontariff measures on global trade. The result shows that non-tariff measures negatively influence global trade and welfare.

Conversely, Santeramo and Lamonaca (2019) investigated the effects of NTMs on trade using meta-analysis technique. The outcome of the study showed that NTMs have differing effects on consumers and producers. In addition, the various proxy measures employed in NTMs assessment may also be

responsible for the conflicting results and have theoretical and policy implications. Webb et al. (2019) evaluate the effect of NTMs on trade and consumer welfare in EU countries and United States. The study reveals that using SPS measure over 47% increase in trade was discovered in Canada, while 27% rise in trade was recorded in New Zealand and United States. The study results thus suggest that NTMs facilities trade and consumer welfare.

Timini and Conesa (2019) examined how NTMs affects China's foreign trade applying gravity model and the results revealed that the technical NTMs spur the level of trade, while the non-technical NTMs measures hinders trade performance. Similarly, Movchan et al. (2020) investigated the impact of NTMs on firms productivity and trade in Ukraine using SPS measure from 2008 to 2013. The estimate shows that SPS measures improve trade and firms' productivity. Korwatanasakul and Baek (2021) examine the effect of non-tariff measures on global trade in China using industry level data of 30 nations. The study found that the NTMs exert negatively on global trade participation.

2.2 NTM and welfare

Furthermore, Yi (2020) assessed the role of NTMs on in promoting welfare using data from Japan and EU nations. The outcome of the study reveals that non-tariff measures upsurge the level of welfare development in these nations. Hayakawa et al. (2022) examine the influence of non-tariff measures on trade and welfare. The study results indicate that tariff reduction negatively influenced trade prices, and easing trade restrictions resulted in a substantial reduction in imported products quality, thereby worsening the welfare of consumers in the countries easing the tariffs. Macedo et al. (2020) used datasets of 60 nations to examine the effect of non-tariff measures on global trade using gravity model from 2006 to 2018. The outcome of the study failed to find significant evidence that nontariff measures decrease global trade performance.

2.3. NTMS and market access

Conversely, Ghodsi and Stehrer (2022) report imposing TBTs or SPS measures enhanced the quality of the imported products, and to a greater extent when tougher TBTs are imposed on traded products. Furthermore, the study suggests that even though non-tariff measures have less impact on exports compared to tariffs, they can both hamper and enhance trade. Shepotylo et al. (2022) used data of Ukraine firms from 2008 to 2012 to estimate the effect of NTMs on firm's productivity through forward and backward linkages. The outcome found negative influence of NTMs on firm productivity.

Taken together, empirical studies suggest non-tariff measures influences level of trade. investment and income. However, these influences are conflicting and vary across individual environments. While some studies (e.g., Cadot and Gourdon, 2016; Boza, 2018; Beckman & Arita, 2017) report NTMs negatively affect trade, others (e.g., Guillotreau & Peridy, 2000) found no evidence that NTMs influenced seafood's imports. Moreover, a few others (e.g., Jaffee & Henson, 2004) report NTMs could enhance or discourage exports depending on the prevailing economics of countries and the opportunity costs to others in terms of market share, demand for quality goods and safety.

This disparity in results may be because of growing concerns relating to matters of public health and safety which inspires government regulators to enforce control measures on SPS and (TBT). Hence, it still remains unclear the extent to which NTMs affect welfare, especially in developing economies like Nigeria. In addition, the empirical review also reveals that various non-tariff measurements such as SPS, quantitative restrictions, technical and non-technical measures have been analyzed using general equilibrium analysis and gravity techniques. Moreover, interaction or moderating effect of NTMs measures with trade and welfare has not been investigated. Hence, this study seeks to address this fundamental gap.

3. Methodology

3.1 Data

The sources of our data include International Monetary Fund (exports and imports data), World Bank (Real Gross Domestic Product), and Integrated Trade Intelligence Portal (Sanitary and Phytosanitary measures).

3.2 Empirical Model

The gravity model has been widely employed in the literature, particularly for ex post analyses of trade policies within regional economic communities (RECs). This paper aims to enhance the understanding of how nontariff measures (NTMs) influence trade dynamics within the Economic Community of West African States (ECOWAS) and Nigeria, thereby making a significant methodological contribution. A distinctive feature of this study is its adaptation of the modified Obstfeld and Krugman (2003) model, which incorporates two additional dummy variables to account for policy effects, as detailed below. The study follows Obstfeld and Krugman (2003) gravity model of trade which is an improved model of the Tinbergen (1962) for our empirical model:

$$X_{ij} = C \frac{Y_i Y_j}{D_{ij}^2}$$
 1

where X_{ij} represents the volume of trade from Nigeria to other ECOWAS member (countries j), Y_iY_j denotes the size of the domestic economy and other ECOWAS member countries proxies by gross domestic product (GDP) while D_{ij} is the distance between Nigeria and its export destination and C is a constant term. Therefore, the model for this study takes the following functional form:

$$X_{ij} = C. Y_i^{\beta_1}. Y_j^{\beta_2}. D_{ij}^{\beta_3}$$
 2

After log linearizing the model and augmenting it with SPS:

$$lnX_{ij} = \Delta_{ij} + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 D_{ij} \qquad 3$$

Hence the coefficients β_1 , β_2 and β_3 can be interpreted as elasticities of exports. Further modification can be made to include the SPS and white-noise error term in the model as follows:

$$lnX_{ij} = \alpha_{ij} + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 D_{ij} + \beta_4 S_{ij} + \varepsilon_{ij}$$

$$4$$

where S_{ij} and ε_{ij} represent the SPS and error term respectively. While α_{ij} captures the variables that are explained in the gravity equation such as NTMs, language, border and so on.

The expected signs of Y_i and Y_j are positive, therefore $\beta_1 > 0$ and $\beta_2 > 0$. The expected signs for both D_{ij} and S_{ij} are negative.

3.3 Methods

Panel unit root tests

The study used Levin, Lin and Chu (LLC) and the Im, Pesaran and Shin (IPS) and Augmented Dickey-Fuller (ADF) unit root test to the stationarity of the variables. These are commonly used tests in panel data analysis. Both the LLC and IPS tests are the mean of ADF statistics. The LLC test for unit root assumes that the distribution of the residuals is independent and identical and the mean and variance are zero for all values of the individual countries. This means, for the null hypothesis (H0: q = 1) all the data series have a unit root. While for the alternative hypothesis (H1: q < 1) all the data series have no unit root (are stationary). The difference between the LLC and IPS tests is in the assumptions about the intercept and the slope of the model. The former assumes for heterogeneity while the latter assumes the presence of individual specific effects and thus allows for heterogeneity in the slope as well as in the intercept.

The study employed Pooled Mean Group (PMG) estimation, PARDL approach to examine the long-run relationships among the Nigeria-ECOWAS exports and the explanatory variables. Johansen and Fisher panel cointegration tests, Granger and Dumitrescu Hurlin panel causality tests causality amongst the variables. The determination of cointegration in ARDL application requires two steps procedure. The first, is to establish the presence of a co-integration among the variables. The second, is the estimation of long-run coefficients.

4. Results and Discussion

4.1 Results of the Unit root tests

The results of the LLC, IPS, ADF unit root tests are provided in Table 1. The results of the LLC and the IPS show that at the level the null hypothesis of no unit root in the variables cannot be rejected. While the results of the first differences show that the variables are stationary.

Table 1: H	Panel unit 1	root Results		-		
		LLC		IPS	А	DF
	Level	First	Level	First	Level	First
		difference		difference		difference
lnX	-1.52032	-9.91811***	-1.13986	-7.75254***	2.23185**	0.51826
lnGDPI	1.01320	-4.71956***	-1.62238*	4.29296***	6.08098***	1.13308
lnGDPJ	2.36997	-3.67687***	-0.82099	4.12962***	5.86279***	1.61261
SPS	-0.07500	4.87344***	0.6806	-3.81268***	4.50189***	0.90596

4.2 Cointegration tests Results

The Pedroni and Kao panel co-integration test results in Table 2 show evidence of cointegration as the unit root tests reject the null hypothesis.

The Johansen and Fisher co-integration results in Table 3 indicate 101.7 trace statistic

and maximum eigenvalue statistic of 72.09. These provide evidence of co-integration relationships of Nigeria-ECOWAS bilateral exports, Nigeria's GDP and destination's GDP and SPS.

Table 2: Pedroni and Kac	panel cointegration	tests
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	Pedroni		Kao
Test statistic	Within dimension	Between dimension	
v-statistic	1.205256		
ρ -Statistic	-1.308206*	0.223247	
PP-statistic	-4.481447***	-2.726667***	
ADF-statistic	-5.530142***	-3.546856***	-3.325840***

Table .	3:	Results	of	the	Johansen	and	Fisher	panel	cointegration t	test

Null	Alternative	Fisher statistic	Fisher statistic
hypothesis	hypothesis	(from trace test)	(from max-eigen test)
r = 0	r > 0	101.7***	72.09***
$r \leq 1$	r > 1	41.59***	22.17

4. 3. Granger and Dumitrescu Hurlin panel causality tests

The Granger causality test show that the presence of unidirectional causality between Nigeria-ECOWAS exports and destination's GDP, between Nigeria-ECOWAS exports and SPS and between Nigeria's GDP and SPS in the long-run.

4.4. Long-run estimates of PARDL

The PARDL results of the long-run model in Table 5 show that the coefficient of the GDPJ is positive and statistically significant. This implies that there is long-run positive relationships between exports and GDPJ. The size of the coefficient is greater than unity, which means that Nigeria-ECOWAS exports are dominated by luxury goods as the export demand is income elastic. Furthermore, the coefficient of SPS is negative and statistically significant. This indicates that the SPS has strong negative influence on the total flow of goods from Nigeria to other ECOWAS member states.

The Error Correction Terms (ECT) result in Table 5 shows the speed of adjustment to long-run equilibrium level is 46.67 per cent. Also, the results of the causality tests suggest that unidirectional causality is found from GDPJ to exports, exports to SPS and GDPI to SPS.

Table 4: Causality tests			
Pairwise Granger panel causality test			
DGDPJ does not Granger Cause DX		2.60662	0.0813
DX does not Granger Cause DSPS		2.81527	0.0670
DGDPI does not Granger Cause DSPS		5.65234	0.0054
Dumitrescu Hurlin panel causality tests			
DGDPJ does not homogeneously cause DGDPI	5.50241	2.20983	0.0271
DGDPI does not homogeneously cause DSPS	6.91408	3.20370	0.0014

Table 6 presents the results for the Pooled Mean Group (PMG) estimation and Panel Autoregressive Distributed Lag (PARDL) model. The long run equation indicates that SPS tends to reduce Nigeria's export to other West African countries. The coefficient of COINT is negative and statistically significant indicating the speed of adjustment is 46.67 per cent in general. The coefficient of LOG(GDPJ) indicates the income elasticity of Nigeria's exports is income elastic. It also shows that Nigeria's exports are dominated by luxury goods because the elasticity is larger than unity.

Table 3. I TANDE IVIE-I un command	Table	5:	PARD	L long-run	estimates
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Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LOG(GDPI)	1.201004	0.825736	-1.454466	0.1528
LOG(GDPJ)	4.332422	1.311727	-3.302838	0.0019
SPS	-0.249893	0.042176	5.924974	0.0000
Short Run Equation				
ect_{t-1}	-0.466660	0.327735	-1.423891	0.0114
DLOG(X(-1))	-0.027555	0.151172	-0.182276	0.8562
DLOG(GDPI)	1.868346	2.282242	0.818645	0.0173
DLOG(GDPI(-1))	-1.638430	3.316259	-0.494060	0.6237
DLOG(GDPJ)	6.042491	2.028656	2.978568	0.0047
DLOG(GDPJ(-1))	-4.568547	3.157547	-1.446866	0.1549
D (SPS)	-0.010482	0.097596	-0.107398	0.0150
D (SPS (-1))	0.044884	0.036674	1.223881	0.2274
С	60.929890	41.495970	1.468333	0.1490

Country-specific estimates of PARDL

Table 6 presents the country-specific short run coefficients for the PMG/PARDL model. The

table shows that the coefficient of COINT for each country is negative and statistically significant. It reveals that Togo has the highest speed of adjustment of about 44.86 per cent, while Cote D'Ivoire records the lowest speed of adjustment of about 10.22 per cent.

The coefficients of D(SPS) have mixed signs across the countries. The sign is expected to be

negative, however it is positive for Ghana and Cote D'Ivoire. This is partly due to the fact that SPS measures could be trade-propelling.

Variable	Coefficient	Std. Error	t-Statistic	Probability
Togo				
ect_{t-1}	-0.448607	0.008149	-177.774900	0.0000
DLOG(X(-1))	0.146582	0.003546	41.338070	0.0000
DLOG(GDPI)	8.004966	40.176140	0.199247	0.8548
DLOG(GDPI(-1))	-6.548094	28.005610	-0.233814	0.8302
DLOG(GDPJ)	2.253642	17.373490	0.129717	0.9050
DLOG(GDPJ(-1))	-7.468087	15.363310	-0.486099	0.6602
D(SPS)	-0.214326	0.005674	-37.770310	0.0000
D(SPS(-1))	-0.040846	0.009399	-4.345837	0.0225
С	185.195900	1146.083000	0.161590	0.8819
Gha				
ect_{t-1}	-0.133109	0.001719	-77.419020	0.0000
DLOG(X(-1))	-0.479025	0.034492	-13.888100	0.0008
DLOG(GDPI)	2.642782	3.687727	0.716643	0.5253
DLOG(GDPI(-1))	1.709550	4.660236	0.366838	0.7381
DLOG(GDPJ)	11.665300	3.486294	3.346044	0.0442
DLOG(GDPJ(-1))	3.620598	9.549959	0.379122	0.7298
D(SPS)	0.244474	0.009042	27.038930	0.0001
D(SPS(-1))	0.126638	0.014226	8.901925	0.0030
С	18.017910	33.187130	0.542919	0.6249
Senegal				
ect_{t-1}	-0.182717	0.004381	-41.704610	0.0000
DLOG(X(-1))	0.082560	0.054890	1.504102	0.2296
DLOG(GDPI)	-2.013983	13.676760	-0.147256	0.8923
DLOG(GDPI(-1))	-7.765470	11.378270	-0.682482	0.5439
DLOG(GDPJ)	4.194826	11.645850	0.360199	0.7426
DLOG(GDPJ(-1))	-11.098050	20.021290	-0.554312	0.6180
D(SPS)	-0.092777	0.009468	-9.798778	0.0023
D(SPS(-1))	0.079261	0.004369	18.142120	0.0004
С	26.179290	87.625270	0.298764	0.7846
Cote D'Ivoire				
ect_{t-1}	-0.102206	0.002193	-46.614500	0.0000
DLOG(X(-1))	0.139662	0.013374	10.442760	0.0019
DLOG(GDPI)	-1.160380	1.875914	-0.618568	0.5800
DLOG(GDPI(-1))	6.050296	3.476891	1.740145	0.1802
DLOG(GDPJ)	6.056199	1.792327	3.378959	0.0431
DLOG(GDPJ(-1))	-3.328646	1.728530	-1.925709	0.1498
D(SPS)	0.020702	0.000188	110.383100	0.0000
D(SPS(-1))	0.014483	0.000123	117.296400	0.0000
С	14.326390	47.156650	0.303804	0.7811

Table 6:	PARDL	short run	estimates
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5. Conclusion

The findings of the long run and causality relationship between the Nigeria-ECOWAS exports and the non-trade measures based on the PARDL method and Pedroni co-integration analyses suggest that SPS plays an important role in determining the Nigeria-ECOWAS exports. The results show that SPS impedes further bilateral trade. The findings also indicate that increase in GDPJ directly affects Nigeria-ECOWAS exports. Nigeria policy makers should understand that Nigeria's exports are dominated by luxury goods and its income elasticity is greater than unity.

In the short term, SPS has proven beneficial for the light manufacturing sector, as demonstrated in the scenarios. Additionally, TBT can enhance the agrifood sector if implemented carefully. Policymakers should focus on targeted non-tariff measures that encourage trade while avoiding those that disrupt trade within the regional economic community. Effects of NTMs on Nigeria's export could not be established and requires further investigation.

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