Kashmir Economic Review
ISSN(P): 1011-081X, ISSN(E): 2706-9516
http://www.ker.org.pk

Contemporary Non-Tariff Measures Under the WTO Regime: Case of Pakistan Export to European Countries

ABSTRACT

The World Trade Organisation (WTO) initiated a uniform set of non-tariff measures in 1995, which are now considered as emerging barriers in world trade patterns. The non-tariff measures impede the export of WTO member states. The WTO has asked its members to limit tariff rates. Hence, members have left with only option to levy non-tariff barriers to transform exports. This article's main objective is to examine the effects of non-tariff measures on export of Pakistan to European countries from 1995 to 2018. Poisson Pseudo Maximum Likelihood (PPML) and Zero-inflated PPML (ZI-PPML) estimation methods are deployed to address zero-export in many years and over-dispersion data of export to specified countries, based on the gravity model. The findings show that the GDP of Pakistan and European nations, tariff, distance, and Non-tariff Measures (NTMs) are core determinants, while in some cases, NTMs initiated are export restrictive. In this perspective, tariff, and non-tariff measures are utilized to administer Pakistan's export to the subject region. Similar to the developed countries, Pakistan should also address non-tariff barriers effectively for favourable trade flows.

AUTHORS

Amir Mustafa *
Assistant Professor, National University of Modern Languages, Islamabad, Pakistan.
Author's Contributions: 1,2,3,4,5,6
armustafa@numl.edu.pk
https://orcid.org/0000-0001-7289-1330

Babar Hussain
Assistant Professor, International Islamic University, Islamabad, Pakistan.
Author's Contributions: 1,2,4,6
babar.hussain@iiu.edu.pk
https://orcid.org/ 0000-0001-7333-3373

Keywords
Pakistan, NTMs; PPML; Export; WTO
JEL Classification
F13; F14; R10; L15

Please cite this article as:
Mustafa, A., & Hussain, B. (2022). Contemporary non-tariff measures under the WTO regime: Case of Pakistan export to European countries. *Kashmir Economic Review*, 31(2), 41-50.

*** Correspondence author**
Author's contribution in the article: 1- Conceived and designed the analysis, 2- Reviewed and compiled the literature, 3- Collected the data, 4- Contributed data or analysis tools, 5- Performed the analysis, 6- Wrote the paper, 7- Financial support for the conduct of the study, 8-Other

1. INTRODUCTION

World Trade Organisation (WTO), since its inception in 1995, has promulgated various multilateral agreements to implement for its member states. These agreements include various non-tariff measures Agreements on Sanitary and Phytosanitary (SPS)[1] and Technical Barriers to Trade (TBT)[2] (non-tariff measures-NTMs) have been considered the most effective for enforcing technical and quality standards in the WTO era. The main spirit of NTMs was to save the WTO from trade distortions, which is the core notion in the neoclassical economies. The NTMs have changed such notions by targeting improved economic access and competition in international trade, and reducing domestic subsidies. This would attain through fewer tariffs of quantitative restriction, existing tariffs, quality standards, and technical standards' enforcements. One of the most important presumptions in the neoclassical theories was that their compact information related to the market and the elimination of subsidies and tariffs, which would lead to an increase in NTMs. In a unique way, Pakistan addressed such NTMs, with potential huge growth, higher industrialization, and export to European countries.

The economy of Pakistan is characterized by incomplete information that leads to distorting and trade preventive. Such aspects are indispensable in foreign trade in multiple merchandise. The commodities are not homogenous in multilateral trade with Europe. Countries and firms follow various quality and technical standards and safety regulations to regulate exports. Importing countries sometimes can't ascertain the quality and standards of commodities merely by examining the products at port or during the pre-shipment inspection. Both SPS and TBT handle such issues under the WTO regime.

Consumers and producers have the potential to sell and purchase products of various qualities at the given prices. Henson and Traill (1993) and Viscusi et al. (1995) reported that officials don't intervene in such capitalist settlements. Darby and Karni (1973), Nelson (1970), and Nelson (1974) deliberated it as a distinction of various commodities into three clusters, experience goods, search goods, and credence goods. For the search goods, buyers may ascertain a commodity's quality before its purchase by checking them during pre-shipment physical examination of tea is sufficient to ascertain its character before its export.

The neoclassical verdict may hold the goods in similar cases. The second experiences good, where the purchaser may ascertain the quality of good till, he buys and use it properly. If the commodities are bought repeatedly, where the selection choice is based on previous experience, market forces may take care of themselves. If the buyers buy commodities repeatedly, a company that sells high-quality goods may charge even higher prices. In a case, market imperfections can be managed by repeat purchases (e.g., meat) and firms' goodwill. Third segregation includes credence good where consumer information is imperfect pre-purchase and post-purchase. Chronic and adulteration impact low-level exposures to residues of toxins and pesticides can be risky and unhealthy for the health of humans in the short or long term or due to repeated use. SPS and TBT cover these chronic adulterations. In similar cases, external regulatory parameters are needed in edible trading commodities where standards and quality are of great concern. WTO has asked member states to initiate and implement SPS and TBT that address harmonizing technical and quality standards and restrain discrimination in multilateral trade.

The objective of the research article is to analyse the effects of SPS and TBT (initiated by the Europe countries) against the export of Pakistan to selected European countries. The study also aims to analyse the requisite policy recommendations to address international quality and technical standards to boost exports of Pakistan to European countries.

[1] In international trade, quality and standards set by the WTO to save living human, plants and animal
[2] Technical standards in international trade set by the WTO

This research article is managed in the following scheme: the first section introduces the NTMs, and the second section presents SPS and TBT related to the literature review to bring the significance and research gap. Section 3 provides methodology and data issues, and section 4 presents results with a discussion. The last section brings conclusions and policy recommendations for more export to Europe in the presence of NTMs.

2. TBT AND SPS AGREEMENTS AND IMPLICATIONS

SPS and TBT did not receive much response so far from the industry in Pakistan, a kind of misperception in understanding the gap between SPS and TBT during the WTO regime. This distinction between Non-Tariff Barriers (NTBs) is of complex and technical nature, especially at the goods level. The SPS covers the food and agriculture sector, while TBT addresses all commodities, including food and food-related goods. SPS targets protection for animals, plants, human lives, and health against diseases and pests from the export of food and agri-products. In contrast, TBT deals with trading commodities, including shapes, packaging material, weight requirements, labelling issues, and technical safety.

Articles 3.1 and 3.2 of SPS state, "Members shall base their sanitary and phytosanitary measures on international standards, guidelines, and recommendations. The sanitary and phytosanitary measures that conform to the international standards, guidelines, and recommendations will be deemed necessary to protect human, animal, or plant life or health." International technical standards and safety guidelines and suggestions are presented by the Codex Alimentarius Commission of the World Health Organisation (WHO) and Food and Agriculture Organisation (FAO), and the International Standards Organisation (ISO). Alimentarius guidelines have no backing of international laws, whereas WTO supports quality and technical standards via agreements of SPS and TBT, which declares these technical and quality standards de fecto mandatory for members.

TBT limits the members of WTO to initiate technical and safety laws, conformity assessments, and procedures. Contrariwise, TBT didn't permit expediting extra redundant barriers to export goods, rather TBT should be strong technically and justifiable based on evidence and scientific information. Article 1.3 explains that all goods would be subject to regulations of WTO's agreement on TBT (GATT, 1994). This TBT agreement's Article 2 highlights that members would confirm technical safety standards. The quality standards would not expedite extreme measures for trade flows among WTO members. Resultantly, the technical safety measures bylaws issues would not be trade-restrictive but rather abide by legitimate explicit targets. National Enquiry Points for SPS and TBT are cited in Annex 1, and they deal with all issues related to quality and technical standards.

United Nations Conference on Trade and Development (UNCTAD, 2019) has segregated non-tariff measures into two core sections, technical and nontechnical measures for exports. In the case of exports, technical and safety measures include SPS, TBT, pre-shipment inspection, and other requirements. Nontechnical measures for exports include non-automatic import licensing, quotas, contingent export protective measures, and restrictions that don't include SPS and TBT – taxes and charges, competition, investment measures, and subsidies. Exports comprised export-related measures (UNCTAD, 2019).

3. EMPIRICAL LITERATURE ON TBT AND SPS

3.1 Theoretical Background

NTMs are classified into three categories: 1) levied on imports, including import quota, custom procedure, and administration fee, imports licensing, and prohibition; 2) imposed on export, including export quota, export prohibition, subsidy, voluntary export restraint, and export tax; and 3) levied in the domestic markets

(Staiger, 2012). Anderson & Wincoop (2003) and Anderson & Wincoop (2004) added to the literature by incorporating multilateral resistance trade cost and firm heterogeneous behaviour in the gravity model.

Melitz (2003), and Bernard et al. (2003) examined firm heterogeneity and reported that not all the firms in a country import goods, whereas a few countries join the foreign trade over a certain time. The motivation is fixed cost that is market specific and quite greater in import against the domestic trade. Subsequently, the import data will have zero entries. Standard gravity literature disregards the prevalence of zero imports, whereas Helpman et al. (2008), Melitz & Ottaviano (2008) and Chen & Novy (2011) introduced gravity model with the theoretical interpretation. Metlitz (2003) presented the trade model with the firms' heterogeneity.

Poisson Pseudo Maximum Likelihood (PPML) model is vulnerable because of over-dispersion in the explained variable (Burger, et al. 2009), and larger the number of zero in it, which leads to the consistent but inefficient estimates. Silva and Tenreyro (2011) reported that PPML brings consistent coefficients despite over-dispersion in the explained variable (with a prerequisite of conditional variance not equal to conditional mean); a larger number of zeros doesn't affect its existence. Head and Mayer (2014) claimed Multinomial Pseudo Maximum Likelihood (MPML) works in the simulation than the PPML. Prehn and Brummer (2012) studied PPML efficiently in the presence of over dispersion and found that PPML was well behaved in the bimodally distributed dataset.

3.2 Empirical Literature on Non-tariff Measures

Alaeibakhsh and Ardakani (2012) who quantified the trade impacts of quality and technical regulations on export and reported the negative impacts in the case of Europe Union members. But Xiaohua and Qiu (2012) reported that TBT affects countries' economic growth. A developed country's TBT notification decreases the probability of exporting by the developing countries; however, it increases their export volume. They also ascertained that TBT affects the export of developing countries but impacts the export of developed countries insignificantly, while Essaji (2008) reported similar opinions about the quality and technical regulations initiated by the developing and developed countries. Earlier, Bao and Qiu (2010) found that China has compromised its imports by initiating TBT.

Disdier (2008) described that the NTBs impact developed countries and small firms are damaged at a larger scale. Staiger (2012) complied with Disdier (2008) and reported that during the WTO administration, the world had faced the SPS and TBT measures since 1995 against the agro-products, and these NTBs are trade restrictive than the tariff levels. Arita et al. (2015) has conducted a quantitative analysis of some of the selected TBT and SPS affecting the E.U. and USA agro-trade. They used a gravity model and estimated tariff equivalent NTMs impact on E.U. and USA. The NTMs were assessed as barriers to mutual trade, and the ad-valorem tariff equivalents of these NTMs were examined to be greater than the current tariff rates and tariff rate quota.

Karki (2002) studied TBT and SPS in the SAARC perspective and found that lack of harmonization in quality standards, inadequate regional capacity, compliance cost, SMEs, inadequate testing, certification and accreditation, and legal consistency are major issues in addressing compliance issues. The region needs to review and harmonist regulations to enhance regional trade compliance with NTBs. Information sharing and legal competency may also bring voluminous trade. Khan and Haider (2003) reported that WTO Agreements on TBT and SPS are formulated to harmonize quality and standards to facilitate technical assistance for developing countries.

The above theoretical and empirical literature signified the need for a study between developed European countries and Pakistan. The number of NTMs is increasing under WTO, but the capacity of Pakistan to address them with equal scope needs technical capacity.

4. DATA AND METHODOLOGY

In this research, the secondary data set of used export data of Pakistan to European countries is collected from United Nations Commodity Trade Statistics dataset. GDP data is collected from World Bank, data on distance from Institute for Research on the Int'l Economy, tariff from World Bank, and SPS and TBT from WTO. Table 1 forwards data with its description of these variables.

Table 1: Variables description and sources

Variable	Description	Proxy	Data source
Export(EXPpt)	Export value (dependent variable)		UNComtrade
TBT (tbt)	Natural logarithm of Technical Barrier to Trade	Measure of restrictiveness	WTO
SPS (sps)	Natural logarithm of sanitary and phytosanitary	Measure of restrictiveness	WTO
GDPp (gdppt)	Natural log of Pakistan GDP current U.S. dollars as a reporter country	Size of economy & demand side effect	WDI
GDPeu (gdpeut)	Natural log of Partner countries' GDP current U.S. dollars	Trading capacity	WDI
Exchange rate (exrat)	Official exchange rate (Local Currency Unit LCU per US$ period average)	Competitiveness	World Bank
Tariff rate (tarr)	Effectively Applied Weighted Average %	Measure of restrictiveness	World Bank
Distance (dista)	Natural log of distance in km between capitals of Pakistan and European country's capital cities	Transportation and logistics cost	CEPII
Contiguity (con)	Dummy equal to unity if two countries share a common border	Information cost	CEPII

Gravity Model Approach

The gravity model approach is used to quantify the impacts of SPS and TBT on Pakistan's exports during the WTO regime, i.e., 1995 to 2020. This is one of the standard approaches to the gravity model's estimation; this analysis would add to gravity literature with the core application of SPS and TBT datasets. The gravity model examines export and the impacts of safety and technical regulations. This model was introduced by Tinbergen (1962) and Linnemann (1966) to analyse trade without biased export impediments. The model is developed in log formation (equation 1), and the gravity model for export is derived as follows:

$$ln(eXP_{pt}) = \tau_0 + \tau_1(tarr_{pt}) + \tau_2 ln(tbt_{pt}) + \tau_3 ln(sps_{pt}) + \tau_4 ln(gdp_{pt}) + \tau_5 ln(gdp_{eut}) + \tau_6 ln(dista_{peu}) + \tau_7(exrat_{pt}) + \mu_{ijt} \quad (1)$$

SPSpt and TBTpt show the number of SPS and TBT cases initiated by selected European countries against exports of Pakistan, and distance is the gravity variable between Pakistan and European countries. PPML and ZI-PPML (Zero-inflated PPML) are deployed to estimate the model, and the methods deal with many zero in the exports dataset. It also permits the identification of challenges of time-invariant factors (distance). By using the poisson estimator for fixed effects (unlike PPML), time-invariant regressors would not be skipped, but different pairs of never trading partners from the sample (Silva & Tenreyro, 2006; Silva & Tenreyro, 2011; Kareem et al., 2016). Skewness, Kurtosis, Shapiro-Francia W', and Shapiro-Wilk W normality tests proved the non-normality of data necessary for PPML and ZI-PPML.

5. EMPIRICAL RESULTS AND DISCUSSION

Descriptive statistics of gravity model variables comprised mean, standard deviation, minimum and maximum values. The total number of export values is 648, whereas 232 (36%) export values are missing,

indicating that Pakistan didn't export during all years from 1995 to 2018. ZI-PPML method includes all export data and bilateral zero export values and omits inconsistent estimates conceived from the log-linear approach (Silva & Tenreyro, 2006). ZI-PPML estimates transform the gravity model of equation 2 to the following exponent format:

$$Poisson: E(y\ |x) = E\left(EXP_{pt}\ |x\right) = exp(x'\tau)$$
$$= exp\left(\tau_0 + \tau_1 tarr_{pt} + \tau_2 tbt_{pt} + \tau_3 sp_{ijt} + \tau_4 gdp_{pt} + \tau_5 gdp_{eut} + \tau_6 dista_{peu} + \tau_7 exrat_{pt}\right) + \mu_{ijt} \quad (2)$$

Where $E(y\ |x)$ is expected values and the mean of dependent variable y (export from Pakistan to EU EXpt) conditional on its independent variables x are estimates coefficients. E.U.'s SPS and TBT cases come into force between certain periods (years) when it is initiated. Database of WTO comprises SPS and TBT measures initiated. SPS and TBT cases data is deployed and expedited by respective E.U. against Pakistan.

Data description

In this part, the descriptive statistics of the dataset are forwarded in Table 2. Comparing the export data with the rest of the variables observed that 232 values of exports are missing, which brings that Pakistan doesn't export either to all E.U. countries or in all the years during the analysis period. The figure below confirms that the data is not normal, which is a precondition to applying the maximum likelihood estimation process via PPML and ZI-PPML.

Table 2: Descriptive Statistics of Variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
Export	648	0.138447	.2905758	0	1.728637
Lntariff	648	0.206248	.6660288	0	3.251671
Lnlcu	648	4.214882	.3619693	3.454507	4.802578
lngdpp	648	4.876277	.5839536	4.104889	5.744829
lngdpeu	648	5.050369	1.716265	1.235452	8.29324
Lnsps	648	1.192264	1.30325	0	4.158883
Lntbt	648	2.40856	2.017452	0	6.436151
Lndista	648	1.620993	.1497922	1.289907	1.967468

Cases of SPS and TBT of respective European Union countries came into force when it was initiated. WTO dataset of ITIP gives the data of initiated SPS and TBT cases. The SPS and TBT cases were initiated and enforced by the governments of respective countries against Pakistan.

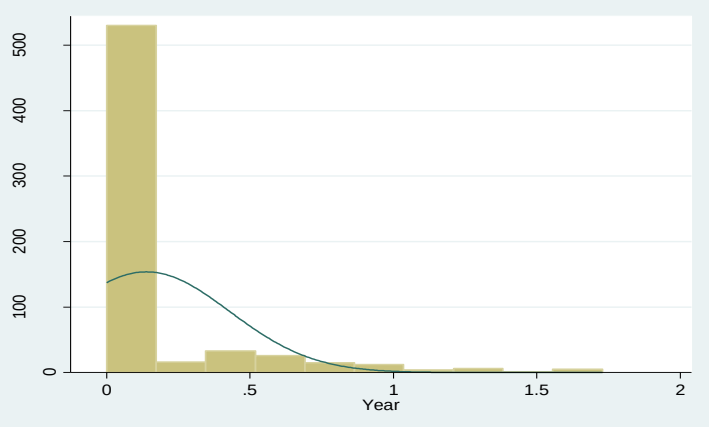

Figure 1: Data distribution of export value (US$)

Data source: UNComtrade, 2021

Sapiro-Francia W and Shapiro-Wilk W tests are applied (Table 3). Figure 1 and all the tests confirmed that export data is not normally distributed. This non-normality export data distribution is a prerequisite for deploying PPML and ZI-PPML.

Table 3: Non-normality distribution tests

Shapiro-Wilk W test of normal data					
Variable	Obs.	W	V	z	Prob > z
Import	648	0.61977	161.674	12.366	0.000
Shapiro-Francia W' test of normal data					
Variable	Obs.	W'	V'	Z	Prob > z
Import	648	0.63334	166.547	11.409	0.0001

Estimated results of ZI-PPML with gravity model (and robust standard errors) are shown in Table 4. The European Union countries initiated SPS and TBT to examine and administer quality and technical parameters for Pakistan. Against the WTO rules and regulations, SPS and TBT are proxies for trade restrictiveness. The results of ZI-PPML witness that Pakistan's exports decline around 0.73 percent after a 1 percent increase in tariff rate. A tariff is a historical restriction for export to any country. Europe, as a protectionist region, has blocked exports from Pakistan. It proved very effective as the value of the coefficient is very high. Fassarella, et al. (2011), Dong & Zhu (2015), Mustafa, et al. (2020), and Olper & Raimondi (2002) implemented various methods, including PPML having similar results. The TBT is a non-tariff barrier to restrict exports, which is initiated to help increase the exports of Pakistan or to improve the technical standards of export commodities for the consumer protection of the European Union. The coefficient of TBT shows that a 1% increase in TBT will increase the exports by 0.26%. It complies with previous research which TBT is promoting to increase exports. It also describes that Pakistan was capable of complying with TBT technical standards posed via WTO. The results assist the previous research of Bao and Qiu (2010).

Table 4: Coefficient Estimation Results of Gravity Model with PPML ZI-PPML

Variables	PPML coefficient	(P-value)	ZI-PPML coefficient	(P-value)
Tariff	-0.6279	(0.35)	-0.7324*	(0.00)
TBT	0.3093*	(0.00)	0.260*	(0.00)
SPS	-0.1532*	(0.00)	-0.1302*	(0.00)
GDPp	2.3552	(0.44)	2.9052*	(0.00)
GDPeu	0.9851	(0.43)	0.9279*	(0.00)
Distance	-4.766*	(0.00)	-3.047*	(0.00)
Exchange Rate	-2.976	(0.69)	-4.187*	(0.00)
No. of observation	648		648	
No. of groups	27		-	
Inflate Equation Results				
Exchange Rate	-		-4.4805	(0.00)*
SPS	-		5.4168	(0.00)*
TBT	-		-0.2435	(0.00)*
Distance	-		-3.5763	(0.15)
Inflation model (logit)	Wald chi2(7) = 2124.88			
Log Pseudolikelihood	-171.7074	Prob > chi2 = 0.0000		

Note: * witnesses significance at α= 1%

The coefficient of SPS depicts that a 1% decrease in SPS will increase the exports by 0.13%. It confirms with several types of research that SPS is trade restrictive to limit the exports of Pakistan. It also elaborates that Pakistan could not comply with the SPS quality and standards. This result helped the previous research

by Thuong (2018), Peterson et al. (2013), Kareem et al. (2016), and Schlueter et al. (2009); these studies produced similar results. The estimated result showed that an increase of 1% in Pakistan's GDP leads to an increase in Pakistan's exports by 2.91%. The result is in line with many researchers, including (Kareem et al., 2016; Thuong, 2018; Hermawan, 2019). These studies are recent in the available literature. Similarly, an increase in GDP of partner European by 1% enhanced exports by 0.93%, assuming the ceteris paribus. European counties' GDP is assumed as a proxy of trading capacity. The results were similar to many types of research inducing (Kaur & Parmjit, 2011; Ronen, 2017; Chen et al., 2018).

Regarding the logistics and transportation costs variables, ZI-PPML estimates revealed that distance affected the probability of Pakistan's exports. It was worth noting that the bilateral distance enhanced the likelihood of zeros. The distance between Pakistan and its European trading partners increased by 1%, and the exports increased by 3.05%. The exchange rate is a proxy of the competitiveness of Pakistan's exports with the rest of the world; it has witnessed a negative sign; an increase of 1% in the exchange rate decreased export of Pakistan by 4.19%. The exchange rate is essential for Pakistan to determine its export.

6. CONCLUSION

The main objective of the research was to analyse the impact of SPS and TBT on exports of Pakistan to the selected European countries under the WTO regime. European countries initiated many SPS and TBT measures for managing multilateral trade from 1995 to 2018. The empirical results of the regression estimation are found in European countries during the analysis period. Hence there is much scope for increasing exports through advancements in NTBs. The estimation shows that increasing the tariff rate has decreased Pakistan's exports. This also deducted that SPS is more effective than TBT in restricting Pakistan's exports. An increase in GDPs of Pakistan and European countries has been proved export promoting in case of Pakistan. Pakistan needs to improve quality standards in the case of SPS as it is creating hurdles in exports, where TBT is trade promoting either due to low tech few exports or country has come up with requisite international technical standards. Pakistan may seek help from European countries (historical trade partners) to enhance its capacity to keep export quality abreast.

Acknowledgment
The authors acknowledge the comments made by the reviewers and members of the editorial board on the earlier version of this manuscript.

Funding Source:
The author(s) received no specific funding for this work.

Conflict of Interests:
The authors have declared that no competing interests exist.

REFERENCES

Alaeibakhsh, S., & Ardakani, Z. (2012). Quantifying the trade effects of SPS and TBT agreements on export of Pistachios from Iran. *World Applied Sciences Journal*, 16(5), 637-641.

Anderson, J. E., & Wincoop, E. V. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170-192.

Anderson, J. E., & Wincoop, E. V. (2004). Trade costs. *Journal of Economic Literature*, 42(3), 691-751.

Arita, S., Mitchell, L., & Beckman, J. (2015). Estimating the effects of selected sanitary and phytosanitary measures and technical barriers to trade on US-EU agricultural trade. United States Department of Agriculture, Washington, D.C.

Bao, X., & Qiu, L. D. (2010). Do technical barriers to trade promote or restrict trade? Evidence from China. *Asia-Pacific Journal of Accounting & Economics*, 17(3), 253-278.

Bernard, A., Eaton, J., Jensen, J. B., & Kortum., S. (2003). Plants and productivity in international trade. *American Economic Review*, 93(4), 1268-1290.

Burger, M. J., Oort, F. V., & Linders, G. M. (2009). On the specification of the gravity model of trade: zeros, excess zeros and zero-inflated estimation. *Spatial Economic Analysis*, 4(2), 167-190.

Chen, N., & Novy., D. (2011). Gravity, trade integration and heterogeneity across industries. *Journal of International Economics*, 85(2), 206-221.

Chen, R., Hartarska, V., & Wilson, N. (2018). The causal impact of HACCP on seafood imports in the US: An application of difference-in-differences within the gravity model. *Food Policy*, 79, 166-178.

Darby, M., & Karni, E. (1973). Free competition and the optimal amount of fraud. *The Journal of Law and Economics*, 16(1), 67-88.

Disdier, A. C. (2008). *Trade effects of SPS and TBT measures on tropical and diversification products. ICTSD Project on Tropical Products*, Issue Paper no.12, International Centre for Trade and Sustainable Development, 1-140.

Dong, Y., & Zhu, Y. (2015). Impact of SPS measures imposed by developed countries on China's tea export-A perspective of differences in standards. *Applied Economics and Finance*, 2(4), 160-169.

Essaji, A. (2008). Technical regulations and specialization in international trade. *Journal of International Economics*, 76(2), 166-176.

Fassarella, L. M., Souza, M. J., & Burnquist, H. L. (2011). Impact of sanitary and technical measures on Brazilian exports of poultry meat. Agricultural & Applied Economics Association's 2011 AAEA & NAREA Joint Annual Meeting, Pennsylvania.

GATT. (1994). General Agreement on Tariff and Trade. Switzerland: World Trade Organization, 1994.

Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of International Economics*, 4, 131-195.

Helpman, E., Melitz, M., & Rubinstein, Y. (2008). Estimating trade flows: trading partners and trading volumes. *Quarterly Journal of Economics*, 123(2), 441-487.

Henson, S., & Traill, B. (1993). The demand for food safety: Market imperfections and the role of government. *Food Policy*, 18(2), 152-162.

Hermawan, I. (2019). *Measuring ASEAN rice non-tariff measures (NTMS) and its impact on Indonesian food (rice) security*. 3rd International Conference on Accounting, Management and Economics 2018 (ICAME 2018), Atlantis Press.

Kareem, F. O., Martinez-Zarzoso, I., & Brümmer, B. (2016). *Fitting the gravity model when zero trade flows are frequent: A comparison of estimation techniques using Africa's trade data*. Global Food Discussion Paper, Germany.

Karki, T. B. (2002). Sanitary and Phytosanitary (SPS) Measures in SAARC Countries. Discussion Paper, SAWTEE, Kathmandu and CUTS, Jaipur.

Kaur, S., & Parmjit, N. (2011). An analysis of actual and potential exports of Pakistan with SAARC countries: A panel data analysis. *Pakistan Journal of Applied Economics*, 21, 69-91.

Khan, S. R., & Haider, S. (2003). *Regional Initiatives (Institutional, Human, Organizational) Required to Implement the Agreements on Technical Barriers to Trade (TBT), and on the Application of Sanitary and Phytosanitary Measures (SPS) and their Provisions*. Islamabad: Sustainable Development Policy Institute; Working Paper No 87; 2003.

Linnemann, H. (1966). An econometric study of international trade flows. Amsterdam: North-Holland Publishing Co.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6), 1695-1725.

Melitz, M., & Ottaviano, G. I. (2008). Market size, trade, and productivity. *Review of Economic Studies*, 75(1), 295-316.

Mustafa, A., Padda, I. U., & Safda, S. (2020). Estimating the Impact of Technical Barriers to Trade in WTO Regime: The Case of Pakistan. *NUST Journal of Social Sciences and Humanities*, 6(2), 194-218.

Nelson, P. (1970). Information and consumer behavior. Journal of Political Economy, 78(2), 311-329.

Nelson, P. (1974). Advertising as information. *Journal of Political Economy*, 82(4), 729-754.

Olper, A., & Raimondi, V. (2002). Elasticity of trade flow to trade barriers: A comparison among emerging estimation techniques. European Association of Agricultural Economists (EAAE), International Congress, Belgium (pp. 1-6). Ghent: The World's Largest Open Access Agricultural & Applied Economics Digital Library, Belgium. Retrieved September 25, 2022, from AgEcon Search: https://ageconsearch.umn.edu/record/44119/

Peterson, E., Grant, J., Roberts, D., & Karov, V. (2013). Evaluating the trade restrictiveness of phytosanitary measures on US fresh fruit and vegetable imports. *American Journal of Agricultural Economics*, 95(4), 842-858.

Prehn, S., & Brümmer, B. (2012). *Bimodality & the Performance of PPML. Institute for Agriceconomics*, Discussion paper 1202, Georg-August Universität Göttingen, Germany.

Ronen, E. (2017). The trade-enhancing effects of non-tariff measures on virgin olive oil. *International Journal of Food and Agricultural Economics*, 5(3), 9-26.

Schlueter, S. W., Wieck, C., & Heckelei, T. (2009). Regulatory policies in meat trade: is there evidence for least trade-distorting sanitary regulations? *American Journal of Agricultural Economics*, 91(5), 1484-1490.

Silva, J. S., & Tenreyro, S. (2011). Further simulation evidence on the performance of the poisson-PML estimator. *Economics Letters*, 112(2), 220-222.

Silva, S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658.

Staiger, R. W. (2012). *Non-tariff measures and the WTO*. WTO Staff Working Paper, No. ERSD-2012-01, World Trade Organization (WTO), Geneva, 1-45.

Thuong, N. T. (2018). The effect of Sanitary and Phytosanitary measures on Vietnam's rice exports. *EconomiA*, 19(2), 251-265.

Tinbergen, J. (1962). Shaping the World Economy: Suggestions for an inteernational economic policy. The Twentieth Century Fund, New York.

UNCTAD. (2019). *International classification of non-tariff measures*. Geneva: United Nations Publications.

Viscusi, K., John, V., & Joseph, H. J. (1995). *Economics of Regulation and Antitrust*, 2nd ed. Cambridge, MA: MIT Press.

Xiaohua, B., & Qiu, L. (2012). How do technical barriers to trade influence trade? *Review of International Economics*, 20(4), 691-706.