

Impact of Technical Non-tariff Measures on Pakistan Exports

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Technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures are two major tools of technical non-tariff barriers set by world trade organisation (WTO) and should strictly followed by WTO member countries. These NTBs are set for safety of food, human, animal, plants and environment. In global competitive market countries can maintain their trade position only if they follow WTO quality and standards of products. These non-tariff barriers have promoted as well as restrict trade. As exports in any country promotes not only because of demand and supply of products but it depends on correct functioning of all micro and macroeconomic policies. This paper discusses the role of Pakistan macroeconomic policies that facilitate trade and redefine the prosperity paths in changing global and local economies. Currently CPEC a big opportunity for Pakistan but its challenge for Pakistan to promote its exports in the presence of non tariff barriers. We analysed impact of these TBT and SPS measures initiated as well as enforced by partner countries on Pakistan's exports, by constructing database of Pakistan and its top export partners that are U.S.A, China, and U.A.E countries, at HS-2 digit product code level from 2003-2016 time period. To quantify TBT and SPS measures we employ coverage ratio and frequency index. Literature shows TBT imposed by importer on Pakistan's exports has positively affected the export performance while SPS discourage exports. A separate effect of these NTBs on manufacturing and agriculture sectors is also analysed. The frequency index and export coverage ratio shows that TBT and SPS measure promoted exports of agricultural and manufacturing sector. The data set is sourced by WTO, UN Comtrade, and WDI.

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1. INTRODUCTION

The non-tariff measures (NTMs) are obstacles to foreign trade; it is considered as non-tariff barriers (NTBs) to trade. These NTBs may be protectionist at the expense of exporters from foreign countries or sometimes non-protectionist, but limit the trade volumes. Technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) agreements of World Trade Organisation (WTO) are technical non-tariff trade barriers measures. These barriers have impacted increasingly on regional as well global trade. The

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members maintain trade quality and standard to ensure that merchandised food is safe for buyers, and to prevent the spread of pests or diseases among living organs. Strict health and safety regulations are being used unnecessarily as an excuse for protecting interests of domestic producers or to maintain comparative advantage. However, bilateral and preferential trade liberalisation policies have been initiated and implemented particularly after accession to WTO.

This research paper analyses the bilateral trade and enforcement of TBT and SPS measures on Pakistan's exportable products by partner countries USA, china, and UAE from 2003-2016, at HS 21 Section products. According to WTO, tariff is customs duty on merchandise imports; it gives a price advantage to locally produce same goods. Non-tariff barriers (NTBs) are such measures that imposed on imports include health, product, labour, environmental standards, internal taxes or charges, and domestic subsidies. Overwhelmingly, tariff and NTMs are levied to protect home country's import competing industrial sector. Tariff are monetary while non-tariff barriers are non monetary barriers used by importing countries. Such NTBs are reduced under regional, plurilateral, or free trade agreements, and sometimes eliminated. NTBs increase the cost of trading, and are more challenging to abolish than the conventional tariff.

The Agreement on the Application of Sanitary and Phytosanitary measures of the WTO sets out the basic rules for quality and standards. The measures should be initiated and enforced only to protect living organisms. Sanitary (human and animal health) and phytosanitary (plant health) measures apply to trading commodities. For the purpose of the SPS Agreement as any measures applied to some specific areas i.e. to protect against risks arising from additives, contaminants, toxins or disease-causing organisms in food; that protect human life from plant- or animal-carried diseases; and protect from pests, diseases, or disease-causing organisms, as well to protect the health of fish and fauna, as well as forests and flora [UNCTAD (2012)]. While technical regulations include product characteristics, their related processes and production methods. TBT may deal with terminology, symbols, packaging, marking and labelling requirements. Standards are approved by an official recognised body which is responsible for issues related to these measures. The process related to TBT that government officials uses are step by step starting from procedures for sampling, testing and inspection; then evaluation, verification and assurance of conformity; and registration, then finally TBT approval and issue certificates that whether the TBT and SPS should impose on products or not [UNCTAD (2012)].

Health and hygiene standards are beneficial to household consumers, as these help to avoid risks associated with food trade and economic losses. If the objective of any SPS measures is to protect local industry, opposite to health and life of humans, animals and plants, the measure can be challenged in Dispute Settlement Body (DSB), governed by the WTO since 1995. The whole process is not only cost ineffective but also a time consuming proposition.

Agreement on Technical Barriers to Trade and Sanitary and Phytosanitary Measures

Article 10 of the Agreement on Technical Barriers to Trade stated that WTO "The TBT agreement aims to ensure that technical regulations, standards, and conformity

assessment procedures are non-discriminatory and do not create unnecessary obstacles to trade. At the same time, it recognises WTO members' right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or protection of the environment". The Article 20b Agreement on sanitary and phytosanitary stated "The SPS Agreement allows countries to set their own standards. However, that regulations must be based on scientific findings and should be applied only to the extent that they are necessary to protect human, animal or plant life or health; they should not unjustifiably discriminate between countries where similar conditions exist" [WTO Agreements (2017)].

The Ministry of Commerce Pakistan collaborated with the standardisation bodies i.e. Pakistan Standards and Quality Control Authority (PSQCA) and Pakistan National Accreditation Council, Ministry of Science and Technology to implement technical standards and testing assessments for implementation of TBT and SPS agreements for exporters and importers. The bodies advise to the Government bodies, industrialists, trade unions and other stakeholders on technical standardisation policies and programmes to promote industrial and agricultural productivity and trade. These organisations are also focal points on TBT and SPS for national and foreign institutions such as ISO and Codex Alimentarius. While the quality standards related NTBs enquiring and issuing authorities in importing countries are as General Administration of Quality Supervision, Inspection and Quarantine of China. American Section of the International Association for Testing Materials (ASTM), American National Standards Institute (ANSI), [International Standardisation Organisation (2017)]. Traders, manufacturers and exporters must be registered with these organisations to ensure adoption and respond according to TBT and SPS notifications.

The study is organised as follow, Section 1 describes facts and current implementation status of TBT agreement under WTO regime. Section 2 comprises on theoretical framework, significance of study, and objectives of the study. The Section 3 contains the literature reviews, and Section 4 explains the research methodology i.e. selection of variables and data, econometric model and estimation technique. The last section contains the conclusion and recommendations of the study.

2. THEORETICAL FRAMEWORK

The relationship of non-tariff barriers instruments like TBT and SPS imposed by importing countries on exporting country products was also explained by traditional theories. Theoretical literatures explain how much export performance depends upon that country product related measures, standards and technology. Traditional trade models predict that countries will specialise in the goods in which they have comparative advantage either due to technology/productivity according to Ricardo model. According to trade model based on monopolistic competition developed by Paul Krugman (1980), identical countries trade differentiated goods because consumers have a preference for variety. In monopolistic competition only the most productive firms export. Exporting countries with more productive firms will have a larger number of exporters and products shipped to overseas markets. On the other hand if exporting costs increase, these models predict reduction in the number of exporters and hence number of products exported. Empirical evidence of the presence of large trade costs that exporting countries faces

other than tariffs, suggests that compliance costs of TBT and SPS are also significant [Melitz (2003); Eaton and Kortum (2002); Melitz and Ottaviano (2007)].

Walter (1971) discussed the implications of non-tariff measures, how were the NTBs applied to imports by the developed countries and the prospects of developing countries export performance. The non-tariff measures impact trade in many ways. First, developing and least developed country exporters are not ready to adjust their infrastructure according to the market requirements. Second, developing and least developed countries do not have the technical capacity and expertise to challenge SPS measures that deviate from international standards due to lack of scientific justification. Technical barriers to trade and sanitary and phytosanitary measures impose compliance costs on exporters. These compliance costs are related to potential adjustments of production process, certification procedures, technology upgradation needed to meet the requirements of the countries imposing such regulations and standards [Schlueter, *et al.* (2009)].

The most common approach used in the literature is a gravity model, to understand the pattern of trade in a globalised world. It has been known since the work of Jan Tinbergen (1962) shows that the size of bilateral trade flows between any two countries can be approximated by a law called the “gravity equation” by analogy with the Newtonian theory of gravitation. Gravity model is stated as the value of trade between any two countries is proportional; other things equal, to the product of the two countries’ GDPs, and diminish with the distance between the two countries.

Gravity models can arise out of a range of trade theories. In particular, Bergstrand (1985 and 1989) shows that a gravity model is a direct implication of a model of trade based on monopolistic competition developed by Paul Krugman (1980). Deardorff (1998) shows that a gravity model can arise from a traditional factor-proportions explanation of trade. Eaton and Kortum (2002) derive a gravity-type equation from a Ricardian type of model, and Helpman, *et al.* (2008) and Chaney (2008) obtained it from a theoretical model of international trade in differentiated goods with firm heterogeneity. Gravity model is well suited to capture the trade effects of NTBs. Moenius (2004) and Mahe (1997) stated that the gravity model is one of the most successful and therefore widely used frameworks for empirical analysis of trade flows between countries. The gravity model has some advantages over other similar methods in estimating the trade flows among countries. The model can estimate the effects of protection on the volume of trade. The gravity model is able to contain the trade-enhancing effect of regulations and the distinct forms of NTBs in estimating the trade flows.

In our study along with Tariff, TBT and SPS, GDP of Pakistan and other importing countries will also be analysed on export performance. We take real GDP of all countries, the real GDP of an exporting country to proxy its supply capacity and the real GDP of an importing country to proxy its demand capacity. GDP indicates country size and economic development level that can affect export dynamics [Besedina (2015)]. In particular rich countries are expected to have high demand of standard food and products. Literatures shows mostly TBT and SPS measures are protectionist tools of developed nations, and developing nation’s exports badly affected due to these measures [Hoekman and Mavroidis (2003); Ederington and Ruta (2016)]. The gravity model includes geographical indicator boarder distance between countries that cause ease in trade in

terms of transportation cost. Exchange rates also an important variable to include in analysis. As impact of exchange rate volatility vary across developed and developing countries, the depreciation of currency against dollars results that country export volume positively while depreciation of importing country currency against dollars negatively affect export volume of exporting country [Kurgman, Obstfeld, and Melitz (2008); Berman, *et al.* (2012)].

2.1. Significance of Study

This study provides latest viewpoint of the prevailing situation in Pakistan in the context of TBT and SPS measures and its impact on exports of Pakistan. Previously no study conducted to examine the both TBT and SPS measures impact on Pakistan overall exports with top exports partner countries. This study will also investigate whether tariff or non tariff barriers to trade affect exports of Pakistan most. We will study the impact of NTBs on exports and along with other selected variables in Pakistan and importing countries i.e. GDP, exchange rate, geographical distance, tariff rate. Reformulate a policy for focusing and improving quality and standards of exported products in Pakistan.

2.2. Objectives of Study

The objectives of the study are following:

- To find out the impact of technical barriers to trade and Sanitary, and phytosanitary measures on exports of Pakistan.
- To find out which non-tariff barriers affect more on exports of Pakistan.
- To compare impact of tariff and non tariff barriers (TBT and SPS) on exports of Pakistan.

3. LITERATURE REVIEW

In this chapter we are going to review the empirical studies at nation and international level, to find the impact/cost of technical barriers to trade and sanitary and phytosanitary measures imposed by importers on Pakistan exports. Most of researchers conclude that TBT and SPS measures imposed by importing countries on exports of partner country hamper exporting countries trade. Some researchers also conclude that TBT SPS can promote trade as well as restrict trade. These NTBs impact on trade is negative for developing countries but positive for developed countries.

3.1. Review of International Literature

Non-tariff barriers (NTBs) include number of obstacle that restricts the ability of companies/countries to export. Non-tariff barriers (NTBs) may now have a greater impact on trade than tariffs. Ardakani, *et al.* (2000) used a gravity model to estimate the trade effect of non-tariff barriers imposed by importer countries on exports of Iran. There study shows a negative impact of non- tariff barriers (NTBs) on exports and their effect were greater than that of tariffs. The export and the world demand for agricultural products increasing focusing on quality, packaging, labelling and standards of products. Europe Union members have reduces their imports from Iran mostly because of SPS and TBT

measures. According to Bora, Kuwahara, and Laird (2002) the developing world is vulnerable to non-tariff barriers (NTBs) specially TBT and SPS measures because these are generally prominent in agriculture (and food generally), textiles, garments and iron and steel. Mostly these are top exporting products so it affects the trade of developing countries largely.

There has been an increasing use of technical barriers to trade (TBT) and Sanitary and Phytosanitary (SPS) measures as instruments of commercial policy in unilateral, regional, and global trade. These non-tariff barriers (NTBSs) may bear additional cost in meeting such mandatory standards to developing countries and may causes market failures Beghin and Bureau (2001), Ferrantino (2006) and Korinek, Melatos and Rau (2008), Maskus, Otsuki, and Wilson (2001), and Maskus and Wilson (2001). All provide comprehensive reviews on key economic issues related to TBT and SPS modelling and measurement. John and Jean (2001) developed methodologies for modelling and quantifying nontariff barriers (NTB) to both imports and exports. The impact of technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures on trade was analysed and methods introduces that provide some quantitative estimates of the impact of such barriers on market equilibrium, trade flows, economic efficiency, and welfare. They focused on Quantification of the effects of such measures on a particular product.

Bao and Qiu (2010) study also empirically examine the influence of TBT imposed by China on the 43 trade partner's agriculture and manufacture products. They use both frequency index and coverage ratio approaches to quantify technical barrier to trade (TBT). Frequency index shows that TBT are trade restrictive, due to the falling probability of market access, china's import values decreases by 0.8 percent. Before joining WTO china's TBT have trade promotion effects, so increases import value by about 0.2 percent, due to the higher market access probability of importers. There study also shows that China's TBT are trade restricting for agriculture goods but trade promoting for manufacturing goods. That result was also proved by Sithamparam and Devadason (2011) study.

3.2. Review of National Literature

The technical barriers to trade (TBT) are one of such barriers that affect trade in Pakistan significantly. The impact of TBT on export performance of Pakistan textile industry has been empirically tested. Shah, *et al.* (2014) argued that due to trade liberalisation; competition has increased, forcing industries to improve their productivity to compete in this free market. However there is impact of technical barriers to trade (TBT) on export performance of Pakistan textile industry. There study empirically evaluated this relationship using primary data. Multiple regression analysis results indicated that technical barriers to trade (TBT) have positively affected the performance of Pakistan textile industry. This result shows the TBT measure that Pakistan faces not create obstacles to international trade, while create harmonisation; firms actively follow WTO rules related to product quality and standard.

Saleem, *et al.* (2014) research shows that Pakistan and India tariff measures are quite high, i.e., 218 percent for agricultural and 176 percent for non-agricultural sector. Trade barriers between these two countries are a result of economic, political and military tensions. Pakistan exports experience huge application of non-tariff barriers by India, i.e.,

technical barriers to trade, sanitary and phytosanitary measures, regulatory and safety requirements that hamper Pakistani exports to India. India follows a restrictive trade regime especially in case of agricultural goods, Similarly for textile exports, India observes a large number of non-tariff barriers including technical barriers to trade (TBT), and sanitary and phytosanitary (SPS) measures. According to Altaf and Mehmood (2015) USA is also among the top ten major trading partners of Pakistan. USA is also top of the list for huge application of non tariff barriers against Pakistan exports. Pakistan face huge trade costs with USA because of large distance, stressed relationship between the government, technical and sanitary requirements from USA government. Pakistan is a country that is included in the list of Restricted Entities by USA, imposition of non-tariff barriers hampers Pakistan's textile and clothing products the most.

Ministry of Commerce (2016) highlighted these issues in strategic trade policy framework 2015-18 and also show government work on it to enhance standards and exports. Due to use of inefficient technologies Pakistan's exports of some sectors i.e., fans, home appliances, rice, cutlery and sports goods is not increasing. So in order to up gradation of technology some investment support and markup support programmes are initiated for investors. As currently no brand certification development support policy in Pakistan, so the Government decided to provide grant to facilitate the branding and certification for faster growth of the SME and export sector in Pakistan's economy. Ministries of Science and Technology, Commerce and National Food Security and Research will be constituted to work on quality standardisation and harmonisation of Pakistan standards. There is considerable potential for increase of exports of basmati rice, horticulture, meat and meat products and jewellery in China in the short-term through strategic interventions in technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures.

4. DATA AND METHODOLOGY

In this chapter we present the methodology to conduct the study. The study is based on panel data for the period 2003-2016. We will use data of Pakistan exports at HS-2 digit level from 2003-2016 using UN Comtrade database. TBT SPS and Tariff data will be collected from World Trade Organisation (WTO), and exchange rate and GDP, tariff data from World Development Indicators (WDI) of the World Bank, and uses gravity indicator distance from CEPII database. In this study we want to find how much TBT and SPS measures imposed by importers affect different Pakistan's exports. To quantify TBT SPS we use two approaches Frequency index (FI) and Export coverage ratio (CR).

According to Economic survey of Pakistan 2015-16, Pakistan's major export partners are United States of America, China, United Arab Emirates.¹ These all countries initiate and enforced Technical barriers to trade (TBT) and Sanitary and phytosanitary (SPS) measures against Pakistan. All countries are members of World trade organisation (WTO), but there joining dates of WTO are different. Pakistan joined WTO in 1995; we collected data of TBT and SPS from WTO,² for the years of 2003-2016. In our sample, Pakistan is exporting country, whereas above all are importing country of all agriculture and industrial level products at HS-2 digit level of Harmonised System. The detail of HS

¹Ministry of Finance, Government of Pakistan (2017).

²WTO Integrated Trade Intelligence Portal (I-TIP), online dataset accessed on 16, March 2017.

Sections, product description and number of technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures that uses against Pakistan's exports by USA, China, and UAE , by following WTO rules is given in below table.

Table
*Summary of TBT and SPS Measures Initiated and Enforced on
Pakistan Exports by Importers in 2003-2016*

HS Section	HS Product Description	SPS	TBT
TOTAL		3319	2732
S01	Live animals and products	334	196
S02	Vegetable products	283	280
S03	Animal and vegetable fats, oils and waxes	30	108
S04	Prepared foodstuff; beverages, spirits, vinegar; tobacco	201	423
S05	Mineral products	4	233
S06	Products of the chemical and allied industries	139	614
S07	Resins, plastics and articles; rubber and articles	43	425
S08	Hides, skins and articles; saddlery and travel goods	2	11
S09	Wood, cork and articles; basketware	7	65
S10	Paper, paperboard and articles	6	44
S11	Textiles and articles	1	99
S12	Footwear, headgear; feathers, artif. flowers, fans		41
S13	Articles of stone, plaster; ceramic prod.; glass	2	212
S14	Pearls, precious stones and metals; coin		12
S15	Base metals and articles	6	210
S16	Machinery and electrical equipment	6	889
S17	Vehicles, aircraft and vessels		401
S18	Instruments, clocks, recorders and reproducers	2	350
S19	Arms and ammunition		15
S20	Miscellaneous manufactured articles		392
S21	Works of art and antiques		14

Source: I-TIPS WTO.

4.1. Definition of Variables

Name	Variable	Description	Expected Sign	Data Source
EX	Export	Bilateral merchandise exports of Pakistan to partner countries. It is calculated in current US dollars.		UNCOMTRADE
GDP	Gross Domestic Products	GDP reflects the value of all goods and services produced by an country i and j in current US dollars in a given year. We uses both GDP of Pakistan and importing countries.	Positive	WDI, World Bank
Dist	Distance	The geographical distance between Pakistan and partner countries borders (in Kilo meters).		CEPII
ER	Exchange Rate	Exchange rate shows worth of PK Rupee against US \$.	Positive	WDI, World Bank
Tariff	Tariff	Product of simple average tariffs imposed by partner country on Pakistan export Products at HS 2 code level.	Negative	WDI, World Bank
TBT	Technical Barriers to Trade	TBT measures deals with terminology, symbols, packaging, marking and labelling requirements, in order to protect national security, environment, human, animal and plants. TBT measures at HS 2 digit code data are used.	Negative	WTO, I-TIP
SPS	Sanitary and Phytosanitary	The SPS Agreement concerns with specific risks related to human health (mostly about food safety) and animal/plant health or life or protection from pests. A SPS measure at HS 2 digit code data is used.	Negative	WTO, I-TIP

4.2. Econometric Model

On the basis of discussion with respect to link between exports and the independent variables (technical barriers to trade, sanitary and phytosanitary, exchange rate and real GDP), we have specified following model: the NTBs are estimated through gravity equation. The econometric model predicts that bilateral trade flows are proportional to the size of their economies and inversely related to the distance between

them. The simplest specification of the gravity model given by Jan Tinbergen (1962) takes the following form:

$$X_{ijt} = a_0(GDP_{it})^{a_1}(GDP_{jt})^{a_2}(Dist_{ij})^{a_3} \varepsilon_{ij} \quad \dots \quad \dots \quad \dots \quad (1)$$

Where X_{ijt} is the value of bilateral trade from exporter i to the importer j in time t . GDP_{it} and GDP_{jt} is the level of real gross product in country i and j in time period t . $Dist_{ij}$ is the bilateral geographical distance between countries i and j . where the error term ε_{ij} is assumed to be identically and independently distributed.

The specification of the gravity model for use in studying international trade flows started with Tinbergen (1962). His specification included the three variables in Equation (1) addition to a fourth variable (A_{ijt}) that accounts for other variables that are either promoting or restricting trade between country i and j at time t , as is shown in the following equation:

$$X_{ijt} = a_0(GDP_{it})^{a_1}(GDP_{jt})^{a_2}(Dist_{ij})^{a_3}(A_{ijt})^{a_4} \varepsilon_{ij} \quad \dots \quad \dots \quad \dots \quad (2)$$

If take its natural log then Equation (2) will be

$$\ln X_{ijt} = a_0 + a_1 \ln GDP_{it} + a_2 \ln GDP_{jt} + a_3 \ln Dist_{ij} + a_4 \ln A_{ijt} + \varepsilon_{ij} \quad (3)$$

In above equation the coefficients $a_1 > 0, a_2 > 0, a_3 < 0$. The coefficient a_3 represents the trade friction resulting from trade costs especially transportation costs. Gravity equation captures the effect (A_{ijt}) includes tariff and non-tariff barriers [World Trade Report (2012)]. Exchange rate volatility largely affects exports in a country like Pakistan. The model captures the following characteristics as in Equation (4).

$$\begin{aligned} \ln EX_{ijt}^k &= a_0 + a_1 \ln GDP_{it} + a_2 \ln GDP_{jt} + a_3 \ln Dist_{ij} + a_4 \ln ER_{it} \\ &+ a_7 \ln Tariff_{ijt}^k + a_8 TBT_{ijt}^k + a_9 SPS_{ijt}^k + \varepsilon \quad \dots \quad \dots \quad (4) \end{aligned}$$

Where

- i = exporting country,
- j = importing country (1.....3),
- t = 1....13,
- k = products at HS section level (1....21)

Where the explanatory and explained variables are defined as follows:

- EX_{ijt}^k is the value of Pakistan's export of product k from country j in year t
- $\ln ER_{it}$ is Pakistan's exchange rate in year t
- $\ln GDP_{it}$ and $\ln GDP_{jt}$ are Pakistan's and country j GDP in year t , respectively.
- $\ln Dist_{ij}$ is the border distance between Pakistan i and partner country j .
- $\ln Tariff_{ijt}^k$ is the importing country j tariff applied to product k of exporting country i in year t ;
- TBT_{ijt}^k is the frequency index or export coverage ratio of country j TBT applied to product k of country i in year t ;
- SPS_{ijt}^k is the frequency index or export coverage ratio of country j SPS applied to product k of country i in year t ;

4.3. Quantification Techniques for Technical Barriers to Trade and Sanitary and Phytosanitary Measures

Inventory Approach

Bora, *et al.* (2002) provided a review of various approaches to quantify TBT and SPS. Conventionally, there are two approaches, which are the frequency index and coverage ratio. In Bao and Qiu (2009, 2010, 2012), uses this approach to quantify these NTBs. Export coverage ratio (ECR) and frequency index are reviewed by Bora, *et al.* (2002), so we used to quantify TBT and SPS effects on Pakistan's export.

Export Coverage Ratio

The export coverage ratio covers the extent of export covered by enforcement of TBT and SPS. The ratio of TBT and SPS in Pakistan for product category j in a year is the percentage of export by Pakistan in product category j which is affected by TBT and SPS in respective year, and denoted by

$$ECR_j = \frac{\sum_i D_i V_i}{\sum_i V_i} \times 100 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

where i is export good contained in product category j (HS 2). If TBT and SPS is enforced to good i , the dummy variable D_i take value one if TBT and SPS is enforced and zero otherwise. V_i is the value of good i 's exported by Pakistan to importing country k . Thus, the coverage ratio of good category j is higher if more of goods are subject to TBT and SPS scrutiny and/or the goods under TBT and SPS have larger exports values. However, there is a difficulty with the coverage ratio: the endogeneity of weights in export values. In extreme, if TBT and SPS is so restrictive in good i , it will preclude all export of good i , and ultimately the weight V_i will be zero. Coverage ratio is downward biased in regression. One solution to this issue is to use the counterfactual free trade weights, but it's not available. Alternatively, we add frequency index, which does not suffer from this issue.

Frequency Index

The frequency index covers the presence/absence of TBT and SPS in a product without considering the exports value covered. FI forwards the percentage of exports transactions affected by TBT and SPS in Pakistan. Specifically, the frequency index of TBT and SPS in Pakistan for product category j in a particular year is the percentage of export goods by Pakistan in product category j affected by importing country k TBT and SPS in that year:

$$FI_j = \frac{\sum_i D_i E_i}{\sum_i E_i} \times 100 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (6)$$

Where i is export good contained in product category j (HS 2). If TBT and SPS is enforced to good i , the dummy variable D_i takes value of one and zero otherwise. E_i is dummy variable equal to one if value of export of particular product i exists and zero otherwise. Frequency index does not show relative value of affected goods.

Frequency index measures the number of goods subject to TBT and SPS as percentage of total number of goods in a good category, whereas coverage ratio measures value of exports of TBT affected good as percentage of total imports of good category. In case of frequency index, the occurrence of TBT is not weighted by export value, whereas in coverage ratio, it weighted by export value.

5. RESULTS AND DISCUSSION

HS sections categories products into 21 sections products, which further categories into HS-2 level code products i.e. 1-97 products. We aggregate HS 2 digit coded products data into HS sections to measures the impact of non-tariff barriers on Pakistan exportable products. We estimate them by pooling the USA, china, and UAE data, as gravity model involves some time invariant factors that effect can seen after pooling many countries data. The pooled Estimated Generalised Least Square (EGLS) results of non-agricultural products are shown in Table 1. Results of pooled estimated generalised least squares model show that Pakistan exports for selected trading partner are significantly dependant on the explanatory variables included in the model. Dependant variable is the log of all HS section merchandise bilateral export products.

Table 1

Empirical Results of Pooled EGLS: Total Exports at All HS Section Products

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	98.42763	4.086275	24.08737	0.0000*
CRSPS	0.008675	0.001326	6.542395	0.0000*
CRTBT	0.014881	0.000928	16.03816	0.0000*
FISPS	-0.001586	0.001482	-1.070189	0.2845
FITBT	0.015948	0.001019	15.65619	0.0000*
Tariff	-0.025350	0.003699	-6.853958	0.0000*
ER	0.007458	0.002557	2.916897	0.0035*
GDP	1.662587	0.076175	21.82576	0.0000*
GDPP	-0.885426	0.143065	-6.188998	0.0000*
Dist	-13.63136	0.373952	-36.45217	0.0000*
R-squared	0.130363	Mean dependent var		14.87961
Adjusted R-squared	0.130207	S.D. dependent var		4.248135
S.E. of regression	3.961926	Sum squared resid		872038.9
F-statistic	832.7983	Durbin-Watson stat		0.433223
Prob(F-statistic)	0.000000			

* Significant at 5 percent.

Pooled EGLS (Cross-section random effects) shows export coverage ratio for sanitary and phytosanitary measures (CRSPS) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent SPS measure imposed by importers then exports of Pakistan increases by 0.008 percent. t-statistics and p-values shows Coverage ratio for SPS is highly significant at 5 percent level of significance. Frequency index for sanitary and phytosanitary measures (FISPS) that USA, China, and UAE impose on Pakistan exported products discourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent SPS measure imposed by importers then exports of Pakistan increases by 0.001 percent. However this variable is not

statistically significant. Export coverage ratio for technical barriers to trade measures (CRTBT) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent TBT measure imposed by importers then exports of Pakistan increases by 0.014 percent. t-statistics is 16.03816 and p-values is 0.000 shows that is highly statistically significant at 5 percent level of significance. Frequency index for technical barriers to trade measures (FITBT) that Pakistan exports faces encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent increase in TBT measure imposed by importers then exports of Pakistan increases by 0.015 percent. result shows that it is statistically highly significant.

Tariff always act as an obstacle to international trade thus negatively affect exports. Because tariffs imposed on goods causing a switch towards intra-national trade leading to decrease exports. Here estimated coefficient sign for average tariff that importing countries imposes on Pakistan is negative and is statistically significant. Results show that 1 percent increase in tariffs will decrease the exports by 0.025 percent. These results are in line with the findings of Novy (2013) and Wincoop, *et al.* (2004). While the results depict that nominal exchange rate (ER) is statistically significant at 5 percent level and has a positive sign. Thus, showing that there is a direct relationship between depreciation of nominal exchange rate and exports of Pakistan. In other words, with depreciation of the exchange rate, total volume of exports. The coefficient for exchange rate suggests that 1 percent depreciation of exchange rate increases exports by 0.0074 percent. It shows that with depreciation of nominal exchange rate increases total exports with selected countries over the period of 2003-2016.

Results show that the GDP of Pakistan (GDPP) has negative effect on Pakistan's export to USA, China, and UAE. 1 percent increase in Pakistan's GDP decreases Pakistan export by 0.88 percent. Supporting this result, Irshad (2016) also found similar results. Conversely, Pakistan's GDP does not have much influence on its exports. GDP of USA China UAE (GDP) positively influence Pakistan exports, its coefficient shows 1 percent increase in there GDP will increase Pakistan export demand by 1.66 percent. Therefore, in present conditions, Pakistan benefits more from the bilateral trade because its' exports are positively correlated with trading partner GDP, which is growing faster than Pakistan's GDP.

Distance (Dist), common language (Comlang) are geographic determinants of trade barriers. Distance between the trading partners affects the physical transport cost. Geographic distance between the trading countries is a hindrance to bilateral trade flows. The estimated results show that geographic distance between Pakistan and its trading partners is negatively related to the exports of Pakistan. It indicates that 1 percent increase in distance decreases the exports by 13.63 percent. In other worlds Pakistan exports increases as it is demanded by country close to us. It is highly significant at 5 percent level of significance. R^2 shows 13 percent exports volume is explained by independent variables. Our result is consistent with the study of Duan and Jason (2012).

Impact of Technical Barriers to Trade and Sanitary Phytosanitary Measures on Pakistan Agricultural Exports

HS sections specifies 1-4 code sections to agricultural products. At HS 2 digit level agricultural products includes 1-23 HS coded products. We aggregate HS 2 digit coded products data into HS sections to measures the impact of non-tariff barriers on

Pakistan exportable products. We estimate them by pooling the USA, china, and UAE data, as gravity model involves some time invariant factors that effect can seen after pooling many countries data. The pooled Estimated Generalised Least Square (EGLS) results of non agricultural products are shown in Table 2.

Estimation shows that export coverage ratio for sanitary and phytosanitary measures (CRSPS) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent SPS measure imposed by importers then exports of Pakistan increases by 0.001 percent. coverage ratio shows very less impact of SPS measure on Pakistan exports and is statistically insignificant. Frequency index for sanitary and phytosanitary measures (FISPS) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent increase in SPS measure imposed by importers then exports of Pakistan increases by 0.026 percent. However this variable is also statistically significant at 5 percent level of significance. Export coverage ratio for technical barriers to trade measures (CRTBT) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent TBT measure imposed by importers then exports of Pakistan increases by 0.016 percent. t-statistics is 2.954019 and p-values is 0.000 shows that is highly statistically significant at 5 percent level of significance. Frequency index for technical barriers to trade measures (FITBT) that Pakistan exports faces encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent increase in TBT measure imposed by importers then exports of Pakistan increases by 0.02 percent. Result shows that it is statistically highly significant.

Table 2

Empirical Results of Pooled EGLS: Agricultural Products at HS Section Level

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	79.69269	21.35894	3.731116	0.0002*
CRSPS	0.001355	0.004762	0.284580	0.7760
CRTBT	0.016346	0.005533	2.954019	0.0032*
FISSPS	0.026176	0.005341	4.901337	0.0000*
FITBT	0.020580	0.006473	3.179119	0.0015*
Tariff	-0.024511	0.015472	-1.584185	0.1133
ER	0.029293	0.013356	2.193212	0.0284*
GDP	1.019995	0.397195	2.567994	0.0103*
GDPP	-0.093610	0.754870	-0.124008	0.9013
Dist	-11.75108	1.935304	-6.071959	0.0000*
R-squared	0.211033	Mean dependent var		15.07567
Adjusted R-squared	0.202724	S.D. dependent var		4.361669
S.E. of regression	3.894548	Akaike info criterion		5.567885
Sum squared resid	30244.01	Schwarz criterion		5.629093
Log likelihood	-5590.428	Hannan-Quinn criter.		5.590350
F-statistic	25.39784	Durbin-Watson stat		0.491850
Prob(F-statistic)	0.000000			

*Significant at 5 percent.

Tariff (T) always act as an obstacle to international trade thus negatively affect exports. Because tariffs imposed on goods causing a switch towards intra-national trade leading to decrease exports. Here estimated coefficient sign for average tariff that importing countries imposes on Pakistan is negative and is statistically insignificant. Results show that 1 percent increase in tariffs will decrease the exports by 0.024 percent. While the results depict that nominal exchange rate (ER) is statistically significant at 5 percent level and has a positive sign. Thus, showing that there is an direct relationship between depreciation of nominal exchange rate and exports of Pakistan. In other words, with depreciation of the exchange rate, total volume of exports. The coefficient for exchange rate suggests that 1 percent depreciation of exchange rate increases exports by 0.02 percent. It shows that with depreciation of nominal exchange rate increases total exports with selected countries over the period of 2003-2016.

Results show that the GDP of Pakistan (GDPP) has negative effect on Pakistan's export to USA, China, and UAE. 1 percent increase in Pakistan's GDP decreases Pakistan export by 0.093 percent. GDP of Pakistan is statistically insignificant for export volume as Pakistan economy is in position to complete with partner developed countries. GDP of USA China UAE (GDP) positively influence Pakistan exports, its coefficient shows 1 percent increase in there GDP will increase Pakistan export demand by 1.01 percent and statistically significant. Therefore, in present conditions, Pakistan benefits more from the bilateral trade because its' exports are positively correlated with trading partner GDP, which is growing faster than Pakistan's GDP.

Distance (Dist) is geographic determinants of trade barriers. Distance between the trading partners affects the physical transport cost. Geographic distance between the trading countries is a hindrance to bilateral trade flows. The estimated results show that geographic distance between Pakistan and its trading partners time invariant and is negatively related to the exports of Pakistan. It indicates that 1 percent increase in distance decreases the exports by 11.75 percent. In other worlds Pakistan exports increases as it is demanded by country close to us. It is highly significant at 5 percent level of significance. R^2 shows 21 percent exports volume is explained by independent variables. Our result is consistent with the study of Duan and Jason (2012).

Impact of Technical barriers to Trade and Sanitary Phytosanitary Measures on Pakistan Non-agricultural Exports

HS sections specifies 5 to 21 code sections to manufacture products. At HS 2 digit level manufacture products includes 24 to 97 HS coded products. We aggregate HS 2 digit coded products data into HS sections to measures the impact of non-tariff barriers on Pakistan exportable products. We estimate them by pooling the USA, china, and UAE data, as gravity model involves some time invariant factors that effect can seen after pooling many countries data. The pooled Estimated Generalised Least Square (EGLS) results of non agricultural products are shown in Table 3.

Table 3

Empirical Results of Pooled EGLS: Agricultural Products at HS Section Level

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.809914	103809.7	4.63E-05	1.0000
CRSPS	0.009478	0.001902	4.983978	0.0000*
CRTBT	0.013639	0.001120	12.17642	0.0000*
FISPS	-0.002385	0.002605	-0.915376	0.3600
FITBT	0.019231	0.001223	15.72555	0.0000*
Tariff	-0.033696	0.005165	-6.524405	0.0000*
ER	0.002374	0.003117	0.761624	0.4463
GDP	1.813191	0.093017	19.49320	0.0000*
GDPP	-1.077774	0.174507	-6.176112	0.0000*
Dist	-1.223134	13584.04	-9.00E-05	0.9999
R-squared	0.145958	Mean dependent var		14.83348
Adjusted R-squared	0.145700	S.D. dependent var		4.219927
S.E. of regression	3.900409	Sum squared resid		553790.6
F-statistic	565.5637	Durbin-Watson stat		0.452989
Prob(F-statistic)	0.000000			

*Significant at 5 percent.

Pooled EGLS (Cross-section random effects) shows export coverage ratio for sanitary and phytosanitary measures (CRSPS) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent SPS measure imposed by importers then exports of Pakistan increases by 0.009 percent. t-statistics and p-values shows Coverage ratio for SPS is highly significant at 5 percent level of significance. Frequency index for sanitary and phytosanitary measures (FISPS) that USA, China, and UAE impose on Pakistan exported products discourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent SPS measure imposed by importers then exports of Pakistan increases by 0.002 percent. However this variable is not statistically significant. Export coverage ratio for technical barriers to trade measures (CRTBT) that USA, China, and UAE impose on Pakistan exported products encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent TBT measure imposed by importers then exports of Pakistan increases by 0.013 percent. t-statistics and p-values shows that is highly statistically significant at 5 percent level of significance. Frequency index for technical barriers to trade measures (FITBT) that Pakistan exports faces encourage exports of Pakistan during the year 2003 to 2016. Result shows if 1 percent increase in TBT measure imposed by importers then exports of Pakistan increases by 0.019 percent. Result shows that it is statistically highly significant.

Tariff always act as an obstacle to international trade thus negatively affect exports. Because tariffs imposed on goods causing a switch towards intra-national trade leading to decrease exports. Here estimated coefficient sign for average tariff that importing countries imposes on Pakistan is negative and is statistically significant. Results show that 1 percent increase in tariffs will decrease the exports by 0.033 percent. These results are in line with the findings of Novy (2013) and Wincoop, *et al.* (2004). While the results depict that nominal exchange rate (ER) is statistically significant at 5 percent level and has a positive sign. Thus,

showing that there is a direct relationship between depreciation of nominal exchange rate and exports of Pakistan. In other words, with depreciation of the exchange rate, total volume of exports. The coefficient for exchange rate suggests that 1 percent depreciation of exchange rate increases exports by 0.002 percent. It shows that with depreciation of nominal exchange rate increases total exports with selected countries over the period of 2003-2016, but insignificant for non agriculture products.

Results show that the GDP of Pakistan (GDPP) has a negative effect on Pakistan's export to USA, China, and UAE. 1 percent increase in Pakistan's GDP decreases Pakistan export by 1.07 percent. Conversely, Pakistan's GDP does not have much influence on its exports. GDP of USA, China, UAE (GDP) positively influence Pakistan exports, its coefficient shows 1 percent increase in their GDP will increase Pakistan export demand by 1.81 percent. Therefore, in present conditions, Pakistan benefits more from the bilateral trade because its exports are positively correlated with trading partner GDP, which is growing faster than Pakistan's GDP.

Distance (Dist) is a geographic determinant of trade barriers, and it is time invariant. Distance between the trading partners affects the physical transport cost. Geographic distance between the trading countries is a hindrance to bilateral trade flows. The estimated results show that geographic distance between Pakistan and its trading partners is negatively related to the exports of Pakistan. It indicates that 1 percent increase in distance decreases the exports by 1.22 percent. In other words, Pakistan exports increase as it is demanded by a country close to us. R^2 shows 14 percent of exports volume is explained by independent variables.

5. CONCLUSION AND POLICY RECOMMENDATIONS

TBT and SPS measures encourage Pakistan exports to its major trading partners i.e. USA, UAE and China. TBT impact on Pakistan exports is relatively more dominant and encouraging than tariff. Tariff hampers exports of Pakistan. Stringent and alarming for Government to take immediate necessary actions to tackle the issue to maintain its comparative advantageous position in concentrated commodity exports. Government must comply on projects suggested in trade policy framework 2015-18. It is the need of time that government should update the capacity building of nodal points i.e., Pakistan Standards and Quality Control Authority (PSQCA), and Pakistan National Accreditation Council (PNA), and Ministry of Science and Technology to boost exports. Reshaping size and dimensions of GDPs of China and USA, as well as UAE may help Pakistan to avail market share with assistance of China. Protectionist macroeconomic policies in wake of CPEC and emergence of Chinese economy at global level reinforce Pakistan to increase its competitiveness to boost exports.

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