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Abstract

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Keywords: Trade, Tariff And Non-Tariff Barriers, Fixed Effects, Gravity Model

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Abstract

The current study analyzes the impact of tariff and Non-Tariff Barriers (NTBs) on exports of Pakistan with its partner countries at aggregated as well as disaggregated level. By employing the Gravity Model of Trade with Fixed Effects methodology controlling for country, product and time fixed effects, the study utilizes panel data from Pakistan and 191 other countries for the period 1995-2017. The findings reveal a negative relationship between tariff barriers and trade flows. In the context of NTBs, both positive and negative relationships are found. Specifically, Sanitary and Phytosanitary (SPS) measures decrease trade, while Technical Barriers to Trade (TBT) measures tend to increase it, particularly at the disaggregated product level. The study concludes that NTBs might not be detrimental for the country. Pakistan's exports are more affected by SPS measures compared to other NTBs. The study's policy implication is that exporters need to prioritize compliance with TBT measures.

Keywords: [Trade, Tariff And Non-Tariff Barriers, Fixed Effects, Gravity Model](#)

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Introduction

Global world trade has experienced consistent growth and trade relationships between countries improved after the collapse of the Soviet Union in the 90s and China became a regular member of the World Trade Organization (WTO) in 2001. In the aftermath of the financial crisis in 2008, global trade

flows followed a significant downturn. Friction in global trade also occurred due to the increase in the imposition of protection measures by the countries. In 2015, countries added 539 different trade restriction measures including tariffs, non-tariff barriers (NTB), rules of origin (ROO), and other trade restriction measures in order to discourage



imports. Among these trade-restrictive measures, most of them were non-tariff barriers (UNCTAD, 2017). The main difference between tariff and non-tariff barriers is that tariffs do increase the cost of imports but NTBs restrict the entry of goods in a country's market. In recent times, countries have faced tariffs, non-tariff barriers, and other frictions that discourage trade. This phenomenon generated interest among researchers to study the relationship between NTBs and trade.

The concept of tariffs is not new. The countries have been applying tariffs for centuries. In "Wealth of Nations", Adam Smith discussed high taxes and restrictive trade arrangements. In the mid-19th century, European countries started to impose tariffs on their imports. At that time, tariffs were very nominal and low but at the start of the 20th century, countries imposed high tariffs against each other, until WWII. After the establishment of The General Agreement on Tariffs and Trade (GATT) in 1947, trade was encouraged, and tariffs were discouraged. Sanchez (1987), Diokno (1987), and Widyahartono (1987) started reporting non-tariff barriers (NTBs) in the late 80s. With the passage of time, economists identified NTBs and studied the relationship between NTBs and GDP and bilateral trade flows.

The World Trade Organization (WTO) somehow managed to curtail tariff barriers between countries. According to WTO "Customs duties on merchandise imports are tariffs. Tariffs provide a price advantage to local-produced goods over similar goods which are imported, and they raise revenues for government". Whereas NTBs are "policy measures, other than customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both" (UNCTAD, 2009).

NTBs are classified into different groups including technical measures, non-technical measures, and export measures. Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) belong to technical measures of NTBs and they cover around 75 percent of the total NTBs enforced worldwide. SPS refers to measures

affecting hygienic requirements, health, and safety of plants, animals, and humans. Whereas TBT refers to measures to protect the environment, technical requirements of certification, inspection, and testing (UNCTAD, 2013). Articles 20 (B), (D), and (G) of GATT allow countries to adopt safety measures on the basis of health safety and environmental issues (WTO, 2003). Indeed, NTBs are applied to increase welfare, protect the environment as well as decrease health safety diseases for humans, plants, and animals.

In 1994, the United Nations Conference on Trade and Development (UNCTAD) collected and classified NTBs. In the conference, it was agreed that tariff and non-tariff barriers are still high, and they needed to be reduced. Further, NTB barriers to trade are not only issued for exporter countries but these are also problematic for importer countries. Importing countries face problems when barriers are imposed, such as technology transfer distortion, lack of variety in products, as well as monopoly created by local producers. NTBs are mostly enforced because of health safety and environmental protection measures.

In the Uruguay round (8th round of multilateral trade negotiations (MTN) from 1986 to 1993) 3 agreements were signed regarding SPS, TBT, and TRIPS (minimum standard agreement) agreements for the food quality and health care of humans, plants, and animals. The member countries of WTO also signed an agreement that allows countries to use NTBs. Using NTBs is a legal method to restrict trade by importing countries as mentioned by WTO (Crivelli & Groeschi, 2016). UNCTAD's (2013) report clearly supports the application of NTBs for the health and safety of humans and animals and environmental protectionism. Uruguay round and WTO agreements on NTBs focus on increasing welfare in the importing country and providing safer products to the consumers. However, some of the countries impose NTBs only to restrict imports using technical and non-technical barriers.

There is a general perspective that tariff barriers and non-tariff barriers decrease trade. A vast

literature is available which supports the argument. Hu and Hwang (2001), Haveman, Usha, and Thursby (2003), and Peterson and Orden (2005) showed that an increase in tariff or non-tariff barriers reduces trade. While there are studies that contradict it. Studies by Disdier, Fontaine, and Mimouni (2007), Fassarella, dePinto, and Burnquist (2011), and Santeramo and Lamonaca (2018) showed that NTBs can also increase trade. When a country applies NTBs to a partner country as a consequence of packaging problems, quality muddles, and environmental or health safety issues, trade tends to decrease. However, if the partner country complies and resolves the issues, trade may boost between both countries.

NTBs can have multifaceted effects. As discussed by Disdier and Martte (2010), NTBs have a negative impact on imports but a positive impact on domestic welfare as well as international welfare due to tightening food safety measures on imported products. Results of different studies show that NTBs have differential effects on developed countries compared to developing countries (Antimiani, Confort, & Salvatici, 2008; Disdier, Fontaine, & Mimoni, 2008). These authors showed that developing countries face more NTBs compared to developed countries. This is because usually developing countries do not take into account health, safety, and environmental protection measures.

Countries trade at the bilateral level, regional level, and global (multilateral) level (under WTO). The studies showed that tariffs and NTBs have both positive as well as negative effects on trade as the theory suggests. The difference in results is based on the selection of time period as well as the number of countries or a number of products. The current study analyzes the effects of tariffs and NTBs on exports of Pakistan with its partners at aggregated as well as disaggregated levels. It also attempts to examine the hindrances or opportunities provided by trade barriers in boosting the exports of Pakistan. The outcomes draw on the important policy implications for Pakistan in order to boost its exports. The research questions are as follows:

- Does an increase in tariff barriers and imposition of NTBs enhance or impede the exports of Pakistan?
- In the case of Pakistan, are NTBs bad for trade relations with trading partners?

The study is structured as follows: Section 2 presents the review of the literature. Section 3 contains the data methodology adopted for the study. Section 4 reports and discusses the main results. Section 5 concludes.

Literature Reviews

Every country wants to increase its exports and impose tariffs on imports. To increase exports, countries take action like giving subsidies to producers, concluding Free Trade Agreements (FTAs), and trading with different countries at reduced tariffs under the WTO (World Trade Organization). To restrict imports, countries use some measures that include both tariff and non-tariff barriers. Tariff barriers are employed as a means to safeguard domestic industries, whereas non-tariff barriers are imposed for health and safety considerations. WTO's role is to increase trade between countries. Furthermore, the role of WTO is to verify whether NTBs applied by any country are legal or it is just to discourage trade. Much theoretical and empirical literature is available regarding the effects of these barriers on trade flows.

Liu et al. (2019) present a rather gloomy picture of these NTBs. They conclude that non-tariff barriers (NTBs) like TBT and SPMs act as new trade barriers, negatively affecting African agri-food exporters by distorting international trade and potentially being more harmful than tariffs. Employing the gravity model, Muradovna (2020) concludes that SPS and NTB have a negative impact on trade. They create obstacles in international trade, impacting the global economy. For Eurasian economies, abolishing NTBs can have a significant and positive impact on trade flow (Vakulchuk & Knobel, 2018).

Crivelli and Groeschi (2016) analyzed the impact of SPS on market entry and trade flows. The

authors used Country-Time fixed effects and estimated gravity model over the years 1995-2010, on 63 importing and 73 exporting countries. Results of the study show that the SPS measure poses a negative impact on exports. Results also show that the SPS measure has a positive effect on imports and increases trade flow for the reporting country but did not affect the partner country. It also shows that SPS only increases the trade flow of both developing and developed countries, who raise concerns over SPS measures at WTO.

Peridy and Ghoneim (2013) examine the effect of NTBs on economics of Middle Eastern countries (MENA). The study develops gravity models following Anderson and van Wincoop (2003). 15 service sectors from 82 countries are selected for the year of 2007. Results show that NTBs are significantly trade-reducing in almost all the selected countries. SPS and TBT are the highest measures of NTBs. Results also show that if MENA countries wanted to integrate with the rest of the world, they had to reduce NTBs and reduce tariffs. Not all NTBs should be removed but those which reduce trade.

Carrere and Melo (2011) elaborated on the topic of NTBs and Behind-The-Border measures (BTB). Behind the border barriers are a kind of NTBs that restrict or discourage trade because it imposes costs and constraints on trade in a non-discriminatory manner. The study discussed the effects of NTBs and BTB on trade flows. This paper is designed in such a way that different topics are summarized in different parts including data on NTBs, categorizing NTBs, SPS and TBT agreements, Food safety and agricultural, welfare effects of NTBs, rules of origin by private interests, approaches to estimate NTBs and different types of NTBs. The paper gives guidelines through which conducting research on NTBs is easier.

In another study, Fassarella, dePinto, and Burnquist (2011) studied the impact of SPS and TBT barriers on Brazilian poultry trade with European Union countries. The fixed effects model and gravity model were used in the study, for the period 1996-2009. Results show that SPS and TBT

have a positive and significant impact on poultry trade. Authors argue that an increase in trade occurs because Brazilian poultry does not have poultry disease in Brazil.

Disdier and Martte (2010) explore the effects of nontariff measures on trade using combinations of gravity model and welfare approaches. Gravity models analyze the effects of NTBs, and the welfare model (Partial equilibrium model) identifies the rigorous welfare effects of NTBs. Econometric results show the negative impact of NTBs on trade whereas the positive impact is on domestic welfare as well as international welfare. The increase in welfare is due to tightening food safety measures on imported products.

Disdier and Tongeren (2010) identify the effect of NTBs in the trade of Agri-food products using cluster analysis. Data of 777 products from OECD countries was selected for the study from 1996 to 2006. Results show that there is a 73.3 % trade coverage ratio and a 17.9% number of notified NTBs in the whole sample. Results also show that fresh products like meat, fish, fresh fruits, and vegetables face more NTBs. Results also show that NTBs highly depend on the number of notification and their trade coverage ratio. The authors suggest that the food security issue is not reflected very well. There should be more work done on food security.

Czubala, Shepherd, and Wilson (2009) study the trade of textiles, clothing, and footwear in African exports to the EU, for the period 1995-2003. The authors investigate the European Union product standards and their impact on African trade. The authors used the gravity model for estimation and their results show that TBTs have a positive and significant impact on trade.

Disdier, Fontaine, and Mimoni (2008) examined the effects of SPS and TBT trade barriers on agricultural trade. 154 importing countries, 183 exporting countries, and 690 products in the year 2004 were used in the study for analysis. The gravity model was used to estimate the data. Results of the study show that SPS and TBT have a negative impact on agricultural products. Results

also show that SPS and TBT have a negative impact on imports to OECD from developing and least developed countries. Whereas EU and OECD trade have positive and significant effects on SPS and TBT. Sectoral results indicate an equal distribution of positive and negative results of SPS and TBT measures for agricultural products.

Antimiani, Confort, and Salvatici (2008) study the effect of trade restrictiveness on agricultural products in developed and developing countries. The General Equilibrium Model was used in the study. Results show that protection rates are lower for developed countries but higher for developing countries, the results are based on tariff rates and per capita income of trading partners. Results also show that both developed and developing countries significantly discriminate across products and tariff rates. It also shows that many developing countries use protection measures on products in agricultural goods, textiles, and clothing.

Cabalu and Rodriguez (2007) quantitatively assess trade-offs in tariff changes implemented by the Philippines. The CGE model was used in the study, 229 industries in the Philippines were studied from the period 2000 to 2005. Five different scenarios were tested in the study. Results show that by changing the tariff charges, real GDP changes by 0.01 percent in the long-run analysis. By changing the tariff policies more industries and regions get benefit. Results also show that by moving at least four percent towards tariff uniformity, aggregate output increases, as well as industries, increase.

Jorgensen and Schroder (2006) study the effect of technical barriers, import licenses, and tariffs as means of limiting market access. The study uses a two-country monopolistic competition model of international trade to identify the welfare effect. Three scenarios were discussed here. It says that if there are more technical barriers to trade measures adopted by the country then fewer foreign firms (products) enter in market. If moderate technical barriers to trade measures are adopted by the country, then moderate firms can access the

market. If fewer technical barriers to trade measures are adopted by the country, then more foreign firms enter the local market.

Wilson and Anton (2006) examine the effects of SPS measures to protect domestic production from pests and diseases. Results show that SPS measures are optimal for welfare as well as mitigation strategies. Results also show that the relative cost of mitigation would determine whether mitigation strategies should be applied for both imports and exports. Mitigation strategy can be defined as actions taken (by any state) to reduce long-term risk to people and property from hazards and their impact.

Fontaine, Mimouni, and Pasteels (2005) examined the effects of environmental SPS and TBT on international trade using the gravity model. Data from 169 products were examined at HS-4-digit codes for 61 countries. Results of the study show that SPS and TBT have a negative impact on fresh and processed food whereas results show that SPS and TBT have positive effects on manufacturing goods. SPS and TBT have a negative impact on the trade of processed food because processed food may contain diseases that can harm human health. On the other hand, manufacturing products have positive effects because it is easy to solve problems faced by products (i.e. it is difficult to store processed food for a long time as compared to manufacturing products).

Blanco and Naya (2005) evaluated the relationship between economic integration, non-tariff barriers, and social welfare. The Homogenous goods produced (with three firms in different countries with constant returns to scale mode) model of Brander (1981) was used in the study. Four assumptions are tested in the study, 1) same import duty for both countries, 2) one country enters into a trade agreement with one of the countries, 3) all the countries create a customs union, 4) one country imposes NTB to the other two countries. Results show that it would be beneficial for the importer country to form a customs union with the country that is selling at a lower cost. Results also show that if the importing country

imposes NTB then it will be worsened. It also shows that by imposing NTB, the profit of the importing country's firm would be increased. Generally, NTB reduces aggregate welfare, but the government imposes NTB to protect its own industry.

Peterson and Orden (2005) examine the effect on poultry trade if tariffs and SPS barriers are removed. The study uses the CES utility function for long-run analysis. The constant elasticity of substitution (CES) utility function is a method to measure utility when there is a combination of two or more consumption goods. Results show that in the long run, if all the tariffs are removed global poultry trade would increase by 26.3%. It also shows that if the tariffs are reduced then production will decrease in importing countries because of an increase in trade flows and a decrease in the import price. According to the results, if only SPS barriers are removed then there would be a minor increase in trade. With the removal of both tariffs and stationary barriers, world poultry production and poultry prices would decrease. There would be a significant impact on poultry trade by the increase of 40.1%.

Haveman, Usha, and Thursby (2003) critically analyzed the effects of trade barriers on trade reduction, trade diversion, and trade compression. The results show that more tariff barriers to trade reduce trade flow as well as shift to countries where they find fewer tariffs. It also shows that trade preferences divert trade and NTBs increase the value of a trade which decreases import demand elasticity, increases the price, and decreases quantity.

Nardella and Boccaletti (2003) examined the US-EU bilateral trade in agro-food and observed the effects of NTB on trade. Results of the study show that the US imposes 70 percent of the NTBs and 30 percent tariff barriers over the EU. Whereas the EU poses 91 percent of NTBs and only 9 percent tariff barriers on the US. Results also show that the US imposed higher NTBs for live animal goods, fish and crustaceans, products of animal origin, and edible vegetables whereas the EU imposed higher

NTBs for live animal goods, fish and crustaceans, and sugars and sugar confectionery.

Clark (1999) studied the effects of NTBs imposed by the US on developing countries in the Western Hemisphere. The study uses data from 38 developing countries which is grouped into 10 sub-groups, groups are made according to their per capita income. The study uses the Suits index (which is closely related to the Lorenz curve) for calculations. The suits index measures, the accumulated percent of total trade on the horizontal axis and the accumulated percent of NTBs covered trade on the vertical axis, which ranges from zero to one. Results show that import quotas, price actions, and tariff rates have the highest trade coverage ratios for Jamaica, Dominican Republic, Nicaragua, Netherlands Antilles, Bermuda, Costa Rica, and Guatemala. It shows that 91 percent of countries face import quotas, 78 percent of countries face non-automatic licenses, and 66 percent of countries face shipment issues regarding trade.

Lee and Swagel (1997) examined the effects of protectionist tariff and non-tariff measures on trade flows and production in 47 countries in the year 1988. The results show that tariffs and NTBs decrease trade between countries. At the industry level, not all industries are protected using protection measures, rather those industries are protected which are weak. Results also show that countries are politically influenced which forces them to implement protective measures.

Winkelmann and Winkelmann (1997) examine the effect of NTB on the pricing behavior of exporter countries. Pricing behavior is a method in which the price is set according to the cost of a competitor's price. The study includes data from Germany, France, the US, Japan, New Zealand, and many other developed nations but checks the impact on New Zealand's imports. Results show that with the increase in NTBs, welfare cost increases. It shows that trade volume decreases between the countries. It also shows that NTBs exceed rent-seeking activities involving licensing to import.

Clark and Zarrilli (1992) study the impact of NTBs on industrial imports of Generalized system of preferences (GSP) covered products. GSP is a Trade Act of 1974 to encourage and promote trade in developing countries, in which duty-free products of developing countries enter developed countries. The results show that countries with GSP-covered products face various NTBs. Countries that grant GSP status to developing countries apply measures like non-automatic licensing procedures and price action measures. Results also show that for GSP-covered imports, NTBs are one of the main deterrents to imports.

Sanchez (1987) identified the effects of NTBs on the Association of Southeast Asian Nations (ASEAN) trade with Japan and intra-ASEAN trade. The results clearly indicate that an increase in NTBs decreases trade between ASEAN countries and Japan. The same is true for intra-ASEAN trade. Japan's product quality and testing requirements have also led to a decrease in trade with ASEAN countries. Intra-ASEAN trade faces issues regarding custom classifications and the imposition of duties, which have increased the cost of exports.

Diokno (1987) examines the NTB effect on Japanese and Philippines' trade over the period of 1973 to 1983. The results of the study show that both countries increased the NTBs against each other which caused Japan's exports to the Philippines to decrease by 14.2 percent and the Philippines's exports to Japan to decrease by 15.6 percent.

Widyahartono (1987) observes the reasons for the contraction of trade between Indonesia and Japan. Results show that an increase in NTBs causes a decrease in trade between Indonesia and Japan. Quantitative restraints and structural NTBs are the

main drivers to distort trade. Based on their results, they suggest that a decrease in NTBs can increase the trade volume between two countries. Ibrahim, Rehman, and Isa (1987) examine the trade of Malaysian goods with ASEAN countries. Results show that quantitative restrictions and customs problems were the main reasons behind the decrease in Malaysian exports.

Data and Methodology

For the current study, data from 192 countries are collected for the period 1995-2016. Data for GDPs (in million dollars) of exporters (Pakistan) and importers (191 countries) are taken from the World Development Indicator (WDI). Data for distance and dummy variables (common border, common language, and common colony) are taken from CEPII (French Institute for Research on the International Economy). Control variables are included in the study as they also have an impact on trade between the countries. Sometimes these variables have significant effects that cannot be neglected in the regression analysis.

Data on Tariff, non-tariff, SPS, and TBT are collected from UN Com-trade [accessed through WITS (World Integration Trade Statistics)]. Data for tariff is taken in percentages and data for non-tariff are represented as in 0's and 1's (1 if non-tariff is applied, 0 otherwise). Data for trade is collected at the HS-2-digit level. Data from 3 groups (out of 15 groups), including Vegetable products, Textile and textile articles, and Footwear/Headgear are used in the study. The reason for selecting these 3 groups is that it covers almost 70 percent of the total exports of Pakistan.

The information below shows the product groups and their respective HS-2 code ranges.

Table 1

Product Groups and Codes	
HS2 Digit Group Codes	Group Codes Titles
06-15	Vegetable products
50-63	Textile and textile articles
64-67	Footwear/Headgear

For our econometric analysis, a fixed effects model is used with panel data. Indeed, fixed effects capture time-invariant unobserved factors which are the potential sources of endogeneity. Three types of fixed effects are employed in the study. Country, product, and time-fixed effects remove heterogeneity of the products and countries as well as time-specific effects. Country-pair-product fixed effects are used to control the problem of self-selection. Self-selection causes biases in the results. Self-selection occurs due to relevant economic decisions determined by a common set of unobserved factors. In our case, the countries self-select themselves which correlates with error terms and therefore causes endogeneity in estimating trade flows.

For country, product and time fixed effects, econometric equation becomes:

$$\ln X_{ijkt} = \alpha + \beta_1(Tariff_{ijkt}) + \beta_2(SPS_{ijkt}) + \beta_3(TBT_{ijkt}) + \beta_4 \ln(GDP_{it}) + \beta_5 \ln(GDP_{jt}) + \beta_6 \ln(Dist_{ij}) + \beta_7(Conting_{ij}) + \beta_8(Comlang_{ij}) + \beta_9(Comcol_{ij}) + \delta_i + \delta_j + \delta_k + \delta_t + \epsilon_{ijkt}$$

For Country-pair-product and time fixed effects, econometric equation becomes:

$$\ln X_{ijkt} = \alpha + \beta_1(Tariff_{ijkt}) + \beta_2(SPS_{ijkt}) + \beta_3(TBT_{ijkt}) + \beta_4 \ln(GDP_{it}) + \beta_5 \ln(GDP_{jt}) + \beta_6 \ln(Dist_{ij}) + \beta_7(Conting_{ij}) + \beta_8(Comlang_{ij}) + \beta_9(Comcol_{ij}) + \gamma_{ijk} + \phi_t + \epsilon_{ijkt}$$

For Country-pair and time-fixed effects (individual product groups), econometric equation becomes:

$$\ln X_{ijt} = \alpha + \beta_1(Tariff_{ijt}) + \beta_2(SPS_{ijt}) + \beta_3(TBT_{ijt}) + \beta_4 \ln(GDP_{it}) + \beta_5 \ln(GDP_{jt}) + \beta_6 \ln(Dist_{ij}) + \beta_7(Conting_{ij}) + \beta_8(Comlang_{ij}) + \beta_9(Comcol_{ij}) + \gamma_{ij} + \phi_t + \epsilon_{ijt}$$

(Here SPS and TBT are sub-groups of non-tariff barriers.)

Results and Discussion

This section discusses estimated outcomes and results of the study, based on fixed effects gravity models including country, product, and time fixed effects, country-pair-product fixed effects, and country-pair fixed effects.

Table 1 shows the results of the estimations using country-pair-products fixed effects and country, product, and time fixed effects.

Table 2

Results of Country, product, and time fixed effects

Dependent Variable	ln (Imports)					
	(1)	(2)	(3)	(4)	(5)	(6)
Log tariff	-0.095 (0.073)	-0.006 (0.106)	-0.003 (0.107)	-0.529*** (0.102)	-0.256* (0.147)	-0.244* (0.140)
NTB		-0.062 (0.245)			-0.151 (0.354)	
SPS			-0.104 (0.281)			-0.566 (0.388)
TBT			-0.135 (0.331)			0.584** (0.313)
Importer GDP	0.693*** (0.204)	1.561*** (0.396)	1.585*** (0.400)	0.572*** (0.216)	1.386*** (0.427)	1.405*** (0.434)
Exporter GDP	-	0.263 (0.413)	0.271 (0.414)	1.012*** (0.232)	0.296 (0.440)	0.310 (0.444)
Long distance	-	-	-	27.302	-8.902	-11.340

Dependent Variable	<i>ln (Imports)</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
Contiguity	-	-	-	(26.424)	(8.127)	(7.982)
Common language	-	-	-	47.283 (43.008)	-0.197 (1.347)	0.450 (1.058)
Common colony	-	-	-	-22.807 (19.695)	9.040 (8.417)	11.779 (8.188)
Constant	-13.157*** (3.643)	-34.422*** (5.926)	-35.000*** (5.939)	-258.177 (219.767)	38.776 (64.947)	57.926 (63.450)
Observations	5,837	1,425	1,425	5,837	1,425	1,425
R-squared	0.221	0.276	0.277	0.769	0.825	0.828
Number of city pair product	447	91	91			
Cty-Pair-prod and time FE	Yes	Yes	Yes	No	No	No
City, product, and time FE	No	No	No	No	No	No

Standard errors are in parentheses. ***, **, * show levels of significant at 1%, 5% and 10% respectively. The gravity covariates are used in the estimations but dropped (from estimations 1, 2, and 3) as they are time-invariant for country pairs.

Results presented in columns 1, 2, and 3 are of country-pair-products fixed effects whereas estimations 4, 5, and 6 show the results of country, product, and time fixed effects. Columns 1 and 4 show results of variables including tariff, importer's GDP, exporter's GDP, distance, and control variables (common language, common border, and common colony). Columns 2 and 5 include results for NTBs whereas columns 3 and 6 show results for SPS and TBT.

Results of country, product, and time-fixed effects show that in all three regressions, the tariff is significant and has an inverse relationship (increase in tariff decreases bilateral trade), as discussed by (Lee and Swagel, 1997) and (Thompson and Reuveny, 1998). Results also show that the importer's GDP plays a significant role in the exports of Pakistan. The larger the GDP of the importer, the higher the exports. The importer's GDP is positive and significant at 1 percent in all estimations. In the case of exporter's (Pakistan's) GDP, the results show that it leads to export

growth, however, only once where the tariff variable included in the regression using country, product, and time fixed effects which is significant at 1 percent. Results for NTB (column 2), SPS, and TBT (column 3) show negative signs but are statistically insignificant. However, in specification (6), TBT appears to increase trade significantly (at 5 percent). These results are rather counterintuitive. These results are also found by Anton (2006) and Yue and Beghin (2009). This can be explained as Pakistan must have invested in adapting its products or processes to comply with the NTBs imposed. By meeting the specific requirements set by importing countries, Pakistan continued to access the market, and its exports increased. Another explanation is related to the differentiation of products. Pakistan offers products that are differentiated in ways that are valued by consumers in importing countries. These products may possess qualities or attributes that are not easily substituted by domestic products or those from other exporting countries, allowing Pakistani

exporters to maintain or even increase their market share despite the imposition of NTBs.

Table 2 shows the results of lagged country, product, and time-fixed effects. One year lag is taken for the analysis because the application of

tariff and non-tariff barriers does not affect instantly, it takes time to implement. Results of the lagged estimations show the same results enforcing tariff barriers would decrease trade whereas TBT would increase trade by 0.546 units (significant at 5 percent).

Table 3

Lagged results of Country, product, and time-fixed effects

Dependent Variable	<i>ln (Imports)</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
Log tariff (lagged)	-0.102 (0.069)	0.030 (0.089)	0.031 (0.090)	-0.535*** (0.103)	-0.216 (0.159)	-0.204 (0.152)
NTB (lagged)		-0.098 (0.237)			-0.099 (0.371)	
SPS (lagged)			-0.064 (0.271)			-0.506 (0.411)
TBT (lagged)			-0.277 (0.349)			0.546** (0.325)
Exporter GDP (lagged)			0.315 (0.437)	1.070*** (0.246)	0.426 (0.478)	0.449 (0.482)
Importer GDP (lagged)	0.790*** (0.203)	1.895*** (0.431)	1.921*** (0.437)	0.577** (0.226)	1.687*** (0.475)	1.701*** (0.484)
Long distance	-	-	-	16.399 (24.135)	-14.744 (8.928)	-16.797* (8.876)
Contiguity	-	-	-	29.459 (39.289)	0.271 (1.368)	0.828 (1.077)
Common language	-	-	-	-14.686 (18.028)	15.090 (9.222)	17.394* (9.093)
Common colony	-	-	-	6.018 (6.519)	-8.740 (7.047)	-10.207 (7.038)
Constant	-14.763*** (3.644)	-36.138*** (8.113)	-42.420*** (6.251)	-168.567 (200.763)	78.017 (71.265)	93.974 (70.525)
Observations	5,459	1,345	1,345	5,459	1,345	1,345
R-squared	0.245	0.316	0.317	0.774	0.831	0.833
Number of cty_pair_prod	429	88	88			
Cty-Pair-prod and time FE	Yes	Yes	Yes	No	No	No
City, product, and time FE	No	No	No	No	No	No

*Standard errors are in parentheses. ***, **, * show levels of significant at 1%, 5% and 10% respectively. The gravity covariates are used in the estimations but dropped (from estimations 1, 2, and 3) as they are time-invariant for country pairs.*

Next, we decided to make a sub-sampling of our original dataset by isolating the top 20 importers of Pakistan's goods. The reason for doing this is that the baseline results may be driven by those

countries that import very small quantities of products from Pakistan. We wanted to see a more nuanced view by analyzing only those countries that make up a large proportion of imports.

Table 4

Results of Country-pair-product fixed effects (Top 20 importers)

Dependent Variable	ln (Imports)		
	(1)	(2)	(3)
Log tariff	-0.318 (0.193)	-0.115 (0.163)	-0.051 (0.151)
NTB		-0.174 (0.693)	
SPS			-1.025* (0.532)
TBT			0.538 (0.402)
Importer GDP	0.530*** (0.350)	0.845* (0.563)	1.165 (0.677)
Exporter GDP	-	-	-
Constant	-8.277*** (53.101)	-4.123*** (80.248)	1.068*** (94.630)
Observations	1,090	410	410
R-squared	0.803	0.852	0.866
Number of cty_pair_prod	80	18	18
Cty-Pair-prod and time FE	Yes	Yes	Yes
Cty , product, and time FE	No	No	No

*Standard errors are in parentheses. ***, **, * show levels of significant at 1%, 5% and 10% respectively. The gravity covariates are used in the estimations but dropped as they are time-invariant for country pairs.*

Table 3 shows the results for the top 20 importers of Pakistan's products. The analysis of this sample reveals that TBT is no longer significant in baseline results. However, SPS becomes statistically significant at 5 percent (see column 3). It shows that if the SPS measure is increased, the exports decrease by 1.78 percent. Results show that bilateral trade would increase by 0.70 and 1.34 respectively for estimations (1) and (2) if the GDP of the importer country is increased by 1 percent. These results are significant at 1 percent and 10

percent respectively. Results of Wilson and (Anton, 2006) and (Yue and Beghin, 2009) show that SPS measures decrease trade because they cover food safety, animal and plant health. In general, food safety, and animal and plant health could be easily affected by diseases and countries avoid trading it from developing countries.

Table 4 shows the lagged results of country, product, and time-fixed effects of the top 20 importers of Pakistan.

Table 4

Lagged Results of Country-pair-product fixed effects (Top 20 importers)

Dependent Variable	ln (imports)		
	(1)	(2)	(3)
Log tariff (lagged)	-0.375** (0.176)	-0.128 (0.166)	-0.057 (0.152)
NTB_(lagged)		-0.215 (0.711)	
SPS (lagged)			-1.091** (0.535)
TBT_(lagged)			0.543 (0.418)
Exporter GDP_(lagged)	1.478*** (0.295)	1.330* (0.658)	1.164 (0.756)
Importer GDP_(lagged)	0.691* (0.399)	1.195* (0.662)	1.539* (0.799)
Constant	-64.323 (59.027)	-1.059 (91.913)	54.342 (111.394)
Observations	1,041	389	389
R-squared	0.811	0.854	0.869
Cty-Pair-prod and time FE	Yes	Yes	Yes
Cty , product, and time FE	No	No	No

Standard errors are in parentheses. ***, **, * show levels of significant at 1%, 5% and 10% respectively. The gravity covariates are used in the estimations but dropped as they are time-invariant for country pairs.

Results are similar to Table 3 as it shows that an increase in tariff would decrease bilateral trade between countries as well as enforcement of SPS would also decrease trade (both results are significant at 5 percent).

Afterward, it would be important to analyze the exports after the imposition of tariff and non-tariff

barriers for individual product groups. The following analysis concerns the effects of these barriers on the exports of three large product groups, namely vegetable, textile, and footwear. The idea for breaking the exports into groups and selecting these three groups is taken from Nakhoda (2018).

Table 5 shows the results.

Table 5

Results of Country-pair fixed effects for individual products (Top 20 importers)

Dependent Variable	ln (imports)					
	(1)	(2)	(1)	(2)	(1)	(2)
	VEGETABLE	VEGETABLE	TEXTILE	TEXTILE	FOOTWEAR	FOOTWEAR
Log tariff	-0.062 (0.092)	-0.043 (0.119)	0.199 (0.173)	0.243 (0.213)	-0.936 (0.517)	-0.961 (0.527)
NTB	0.927 (0.594)		0.970** (0.374)		-0.830 (0.574)	
SPS		0.000		-0.366		-1.065

Dependent Variable	<i>ln (imports)</i>					
	(1)	(2)	(1)	(2)	(1)	(2)
	VEGETABLE	VEGETABLE	TEXTILE	TEXTILE	FOOTWEAR	FOOTWEAR
TBT		(0.267) 1.017		(0.377) 1.118**		(0.831) -0.627
Exporter GDP	0.816*** (0.495)	0.955*** (0.551)	0.101* (0.496)	0.094* (0.572)	0.743* (1.588)	0.620* (1.795)
Importer GDP	-	-	-	-	-	-
Constant	11.825*** (89.946)	13.497*** (78.518)	-2.303* (74.343)	-5.639* (92.519)	9.486*** (105.553)	11.417*** (127.393)
Observations	136	136	138	138	136	136
R-squared	0.836	0.833	0.889	0.891	0.831	0.831
Number of cty_pair	15	15	16	16	15	15
Cty-Pair and time FE	Yes	Yes	Yes	Yes	Yes	Yes
Cty-Prod and time FE	No	No	No	No	No	No

Standard errors are in parentheses. ***, **, * show levels of significant at 1%, 5% and 10% respectively.

The gravity covariates are used in the estimations but dropped as they are time-invariant for country pairs.

Estimation (1) incorporates tariff, NTB, GDP of importers and exporters, distance, and gravity covariates whereas in estimation (2), all the variables are the same, but the NTB variable is decomposed into two different types SPS and TBT. The variable of NTB has positive effects on the exports of the textile product group. An increase in NTB would increase trade by 1.64 percent for textile products whereas an increase in TBT measure would increase trade by 2.06 percent, both the results are significant at 5 percent. Results also show that the GDP of the exporter (i.e. Pakistan) increases for all three product groups significantly. The growth in GDP leads to more exports.

Conclusion

The study analyzes the effects of tariff and non-tariff barriers on exports in Pakistan. The objective of the study was to analyze the effects on aggregated level as well as disaggregated level. The study used panel data for the period of 1995-2017. Data from Pakistan (exporter) and 191 countries

(importers) were used for estimation. The study employed fixed effects with the gravity model as used by (Baier and Bergstrand, 2007). Country, product, and time fixed effects, country-pair-product fixed effects, and country-pair fixed effects were used in the study.

The model used is based on the advanced Gravity model which is directly linked with tariff costs and other costs of exports. The gravity model is considered one of the base models in trade economics. The gravity model states that bilateral trade flow depends upon the GDPs of trading countries as well as their implicit indexes. The basic gravity model only takes into account country sizes and distance whereas the advanced gravity model takes into account transportation costs, tariff costs, and multilateral trade indexes. The advantage of using the gravity model is that it is widely used, and tariff costs are incorporated in the model, so it also makes the estimation easier.

Results of the study found a negative relationship of tariffs with trade (Lee and Swagel, 1997) and

(Thompson and Reuveny, 1998) but mixed results for non-tariffs. Some of the results are contradictory with general results (NTB decreases trade). As Table 1 and Table 2 show, TBT appears to increase trade significantly for all the countries. It shows that it is not necessary that NTBs always decrease trade. NTBs may also increase trade. Results for the top 20 importer countries show that SPS would decrease trade at the aggregated level whereas results are different at the disaggregated level.

Results also show that developed countries enforce more tariffs and NTB on Pakistan because when the top 20 importers are selected it shows more effects than the whole data (most of the top 20 importer countries are developed). When products are divided into groups (vegetable, textile, and footwear), results show that NTB and TBT have a positive relationship with trade flows of textile products whereas NTB and TBT have a negative relationship for footwear products.

Lagged results of all the estimations show consistent results without lagged results. Based on our results, the policy recommendations for Pakistan include expanding existing export promotion programs in order to provide increased support for exporters in accessing foreign markets. This can be achieved by offering financial assistance, market intelligence, and organizing trade missions. These measures aim to assist exporters in effectively navigating non-tariff barriers (NTBs) that they may encounter. Further, there is a need to invest in capacity-building initiatives to enhance the capabilities of Pakistani exporters to effectively comply with non-tariff barriers (NTBs). Providing comprehensive training programs, workshops, and technical assistance to facilitate a better understanding of the regulations and standards should work in enhancing exports.

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Appendix-1

Brief introduction of variables used in econometric models.

Variable	Explanation
X_{ijkt}	Flow of imports, product k from exporter i to importer j in time t
X_{ijt}	Flow of imports, from exporter i to importer j in time t
A	Constant
GDP_{it}	GDP of exporter country i
GDP_{jt}	GDP of importer country j
Tariff	Dummy equal to 1 when country enforce tariff against Pakistan and 0 if not (0 until tariff barrier is not applied)
Non-tariff Barriers	Dummy equal to 1 when country enforce tariff against Pakistan and 0 if not (0 until non-tariff barrier is not applied). SPS and TBT are sub group of non-tariff barrier
Sanitary and phytosanitary measures (SPS)	Dummy equal to 1 when country enforce non-tariff barrier against Pakistan and 0 if not (0 until non-tariff barrier not applied)
Technical barriers to trade (TBT)	Dummy equal to 1 when country enforce non-tariff barrier against Pakistan and 0 if not (0 until non-tariff barrier is not applied)
Dist	Weighted geographical distance in miles between countries
Conting	Common border, 1 if both countries have common border or 0 if not
Comlang	Common language, 1 if both countries have common language or 0 if not
Comcol	Common colony, 1 if both countries have common colony or 0 if not
$\delta_i \delta_j \delta_k$ & δ_t	Country, product and time fixed effects
$\delta_{it} \delta_{jt}$	Country by time fixed effects
γ_{ijk}	Country-pair-product fixed effects
γ_{ij}	Country-pair fixed effects (for individual products)
ϕ_t	Time fixed effects
ϵ_{ij}	Error term
i	Exporter country
j	Importer country
k	Product
t	Time