

# **Impact of Technical Barriers to Trade on Trade between China and Pakistan**

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## **Abstract**

The technical barriers to trade (TBT) posed by WTO has impacted global trade pattern; similarly it has effected bilateral trade between China and Pakistan. This non-tariff barrier (NTB) has promoted trade viz-a-viz restricted trade. Many of China's TBT protect sophisticated manufacturers. Unlike Pakistan, a large proportion of China's TBT create delays and processing hurdles that raise the costs of foreign competitors rather than shutting them out of the market (Kayani and Shah, 2014). Bao and Qiu (2012) found that a country's TBT notifications decrease other countries' probability of exporting, but increase their export volumes. This research paper estimates empirically the effects of TBT notifications on export of Pakistan to China using 4-digit HS code industry level data during 2002-2015, employing coverage ratio and frequency index. Coverage ratio captures the extent of exports covered by TBT, whereas frequency index considers the presence/absence of the TBT in a product without indicating the value of exports covered. When coverage ratio is used for estimation, we found the trade restrictive effects of TBT during the study period; whereas using the frequency index, we analyzed that TBT enforcement increasing export from Pakistan to China. Colossal GDP increase in China also raised export from Pakistan.

## **Introduction**

Bilateral contracts assisted China and Pakistan to establish closer trade ties. Although gravity model holds in this region but trade liberalization and large FDI inflows from China played pivotal role in newly emerged subcontinent. Their mutual economic and common political interests have already been pronounced, as a result, in recent years both countries worked hard to reform their economic and trade regimes. China and Pakistan trade volume reaches to \$18 billion in year 2015 with a 16% increase from 2014. Figure 1 shows export and import of Pakistan to China during 2003 to 2015 and respective trade balance (deficit), which demonstrates a bright economic future of Pakistan in the wake of

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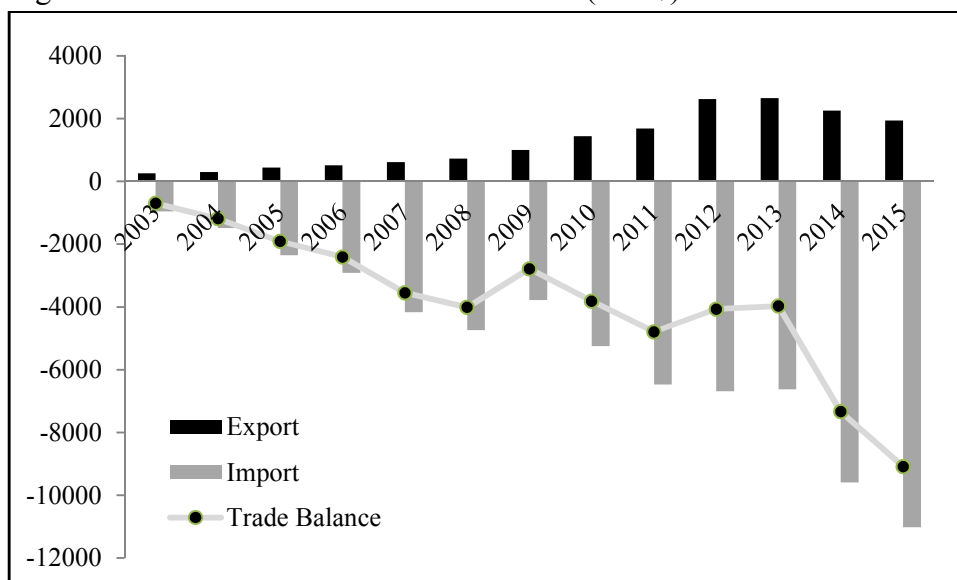
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CPEC (China Pakistan Economic Corridor). Half a decade ago, trade between both countries was among the least integrated of the world's economies. Informal trade and non-tariff barriers have often been cited as major factors explaining that poor commercial cohesion. However, bilateral and preferential trade liberalization policies have been initiated and implemented particularly after a) China's accession to WTO in 2001 and b) launching of CPEC projects. This research paper analyzes bilateral trade and TBT enforcement during 2002 to 2015.

Staiger (2012) bifurcated non-tariff measures (NTMs) into three categories; firstly those imposed on import includes import quotas, prohibitions, import licensing, and customs procedures and administration fees, second those imposed on export include export taxes, subsidies, export quotas, export prohibitions, and voluntary export restraints, whereas third category includes NTMs which are imposed internally in the domestic economy. Such behind-the-border measures include domestic legislation covering technical, health, product, labor, environmental standards, internal taxes or charges, and domestic subsidies.

Overwhelmingly, tariff and non-tariff measures are enforced to protect home country's import competing industries. Tariff brings revenues (similar to taxes) for governments, other non-tariff measures are non-monetary barriers, which protect domestic industries and traders from foreign competition under the WTO regime. According to WTO, NTBs are variety of government actions hampering international trade. Generally, NTMs are policy initiatives, other than ordinary custom tariff, that potentially daunt foreign trade flows of merchandise, and create ambiguous quantitative affects. NTMs (TBT specifically) have multiple uses for policy makers because of its implicit impact.

Figure 1: Trade between Pakistan and China (mln \$)



Data source: UN Comtrade, 2016

The NTMs which obstruct foreign trade are considered as non-tariff barriers (NTBs) to trade. These NTBs may be protectionist at the expense of exporters from foreign countries or non-protectionist, but still restrict the trade volumes. NTBs usually include quotas, levies, standards, sanctions etc. which mostly developed and expedited by developed 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.

NTMs can be bifurcated into technical and non-technical measures. Technical measures include standard rules for product packaging, laboratory tests, labeling, shelf-life restrictions, import testing, and certification procedures. Whereas, non-technical measures include bureaucratic restrictions, subsidies, legal measures such as failure to provide effective intellectual property protection etc. Both technical and non-technical measures bring trade distorting effects to implicitly control trade deals.

Pakistan exports cotton, edibles, electric accessories, furniture, and organic chemicals, hence facing TBTs imposed by China. TBT are enforced mostly on agriculture and edible products exported from Pakistan. The Ministry of Commerce is responsible institution to regulate TBT. On the other side TBT in China protects sophisticated manufacturers' products like restrictions on used mechanical and electronic products, strategic industries, such as small businesses, defense contractors etc. China's TBT processes create delays and processing hurdles, product certification requirements that raise the costs of foreign competitors. The impact of TBT is generally difficult to measure and quantify on export from Pakistan. For example, calculations of the impact of extra licensing requirements, duplicate health certificates, or distribution restrictions are difficult to quantify. Ministry of Commerce China can reduce tariff but managing TBT involves multiple ministries and constituencies. Frequency of TBT enforcement by China on Pakistan's export is listed in Table 5, whereas Table 6 shows top 20 exports to China and percentage change during the study period i.e. 2002-2015.

### **Enforcement of TBT Agreement: Offensive and Defensive Strategies**

In Pakistan, NTBs are blunt instruments and it is difficult to provide targeted protections to strategic industries through NTBs. Pakistan's TBT standards are concentrated on agriculture, plants, and edible products. Ministry of Commerce collaborated with the standardization bodies i.e. Pakistan Standards and Quality Control Authority and Pakistan National Accreditation Council, Ministry of Science and Technology to implement technical standards, testing assessments for implementation of TBT agreement for exporters and importers. The bodies advise to the Government,

industrialists, chambers and other stakeholders on technical standardization policies and programs to promote industrial productivity and trade. These organizations are also focal points for national and foreign institutions such as ISO, International Electrotechnical Commission and Codex Alimentarius, and PSQCA is National Enquiry Point (NEP) on TBT of Pakistan under TBT agreement (Article 10.1, 10.2 and 10.3). Domestic traders, manufacturers and exporters must be registered with the PSQCA to ensure adoption and respond according to TBT notifications. So far, Pakistan has enforced 89 notifications<sup>4</sup> initiated by China under WTO's TBT agreement to standardize Pakistan's exports to China during 2002 to 2015.

China has used TBT extensively since its joining into force in 2002. The Standardization Administration of China (SAC) works under General Administration of Quality Supervision, Inspection and Quarantine of China (AQSIQ). AQSIQ centralizes the applications of standardization system. The Standardization Administration of China is assisted by National Development and Reform Commission (NDRC), the State Food and Drug Administration, the China Association of Standards, various ministries, and local and industry standardization associations. The AQSIQ confirms the application of TBT on importing commodities. These Government institutions support the SAC for development of technical standards through research and international cooperation, which ultimately promote the usage of best global practices in the development of China's technical standards. The AQSIQ is China's TBT National Enquiry Point. The Enquiry Point is responsible for technical standards' inspection, supervision, laws and regulations enforcement, international cooperation, certification and accreditation, and following up China's TBT notifications. China has submitted 1238 TBT notifications to WTO during 2002 to 2015. So far Pakistan has enforced 89 TBT notifications initiated by China (74 cases with HS codes and 15 without HS codes).

China is gradually becoming more and more active in submitting TBT notifications, it has submitted 106 notifications in year 2015 as compared to 49 in 2014. During 2002-2015, TBT measures of China have been most frequently subject to concerns raised by other WTO Members. In 2015, China and EU were subject to the highest number of specific trade concerns (STCs).

Co-operation between Pakistan-China NTBs related organization should be strong enough, so that both countries get benefit from each other's technical standards and skills.

Pakistan has joined WTO in 1995 and China in 2002 and now both are members of the World Trade Organization and in accordance with WTO's Article XXIV of General Agreement on Tariffs and Trade (GATT, 1994), both Members are permitted to enter

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<sup>4</sup> All TBT disaggregated data set is collected from WTO

into bilateral and regional agreements. Both nations have dissimilar economic structures and constricted accordingly. Their specialization in merchandise is based on theory of comparative advantage where nations specialize in those individual segments of production where they are comparatively advantageous. China's exports to Pakistan are more diversified and larger in volume, whereas Pakistan's export of product mix is very limited; around 70% of its exports consist of cotton yarn only (Shabir and Kazmi, 2007). Similarly in 2015, cotton constitutes 77% (followed by cereals 10%) of total export by Pakistan to China.

### **Agreement on Technical Barriers to Trade of WTO**

Accordingly to 21<sup>st</sup> annual review of the implantation and operation, Committee of WTO on TBT reported "during the year, notifications decreased by 12% compared to the previous year (to a total of 1988 notifications). Nevertheless, the trend since 2005 has been upward and driven by the developing Members. In 2015, developing Members continued to submit significantly more new notifications than developed Members - also the number of notifications from LDCs increased during the year. In total, 86 specific trade concerns (STCs) were discussed in 2015, the second highest number since 1995. A much lower proportion of these, however, were notified to the Committee: only 49% of the STCs discussed had been notified (well below the long-run average of 68%). On technical assistance (TA), the Secretariat delivered 18 TA events specifically targeted to the TBT Agreement and an additional 19 TBT modules were delivered as part of various other WTO TA activities" (WTO, 2016).

Article 2 of the Agreement on Technical Barriers to Trade (GATT-1994) stated that WTO "Members shall ensure that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade. For this purpose, technical regulations shall not be more trade-restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create."

The objectives of this research paper are to analyze bilateral trade arrangements between China and Pakistan, and empirically investigate application of Agreement on TBT enforced by China on Pakistan's export. A few of researches have covered impact of TBT enforcements by China on export from Pakistan theoretically. This paper has covered this phenomenon empirically with latest available 4-digit HS code industry level data set on TBT during 2002-2015.

The study is organized as follow; section 1 describes facts and current implementation status of TBT agreement under WTO regime. It also discusses strategies to address TBT issues. Section 2 reviews previous literature on NTBs and TBT related to Pakistan and

China trade, the section 3 presents empirical strategy, model and detailed methodology. Section 4 comprises on results and discussion, followed by conclusion.

## **Literature Review**

Maskus and Wilson (2001) analyze product standards and TBT. There has been an increasing use of technical regulations as instruments of commercial policy in unilateral, regional, and global trade. These NTBs may bear additional costs in meeting such mandatory standards to developing countries. These standards have impacts on both static and dynamic market failures.

Chen et al. (2006) examine effect of technical trade barriers on exporting firms. Foreign standards affect firms' export performance, reflected in export propensity and market diversification. The analysis draws on the World Bank technical barriers to trade in 17 developing countries. Standard and technical barriers to trade in developing countries impose additional cost on exporters i.e. fixed and variable costs. It shows negative relationship between exporting activities and TBT. The result shows testing procedures and inspection procedures by importers reduce exports by 9% and 3%, respectively. Technical barriers to trade cause diseconomy of scale for firms and affects decisions about whether to enter export markets.

Disdier et al. (2008) investigate the effects of TBT on trade. Their work shows the ability to deal with TBTs varies with the size of the business. In general, for small businesses it is very difficult, to comply with the unkind TBT requirements from developed markets, while for large scale businesses the difficulty is less observed. This finding is expected in all industries with all shocks or extra business costs. The transaction costs of assimilating and implementing new information and technologies are spread too thickly on smaller businesses. Compliance with TBT measures implies higher costs, in either production or export, and often induces a shift in the mode of production but does not cause a product shift. Improved TBT requirements results an opportunity to access more profitable markets and to improve business and create better working conditions, raise product durability and also increase productivity and company discipline. Statistical and econometric analyses suggest that the purposes of TBT notification vary across importing countries. At the micro-level, case studies show that small businesses face the most difficulties in complying with TBT measures and private requirements. At macro-level, less developed countries are the most affected by such measures.

The TBT is one of such barriers that affect trade in Pakistan significantly. The impact of TBT on export performance of Pakistan textile industry has been empirically evaluated by Ali (2014). Primary data was collected from top textile firms of Pakistan. Results

indicated that TBT has positively affected the performance of Pakistan textile industry. The regression results showed that there was a significant level of relationship between TBT with export variable. Here, in the case of Pakistan, TBT had positively impacted the export performance of Pakistan's textile industry (Ali, 2014).

Bao and Qiu (2010) develop TBT database from 1998-2006 to examine the influence of TBT imposed by China on the country's imports. They use Tobit model to measure effect of TBT. Frequency index measure shows that TBT are trade restrictive: a one unit increase in TBT will decrease import value by about 0.8%. However, when the coverage ratio is used, it shows that the negative effects of TBT are not statistically significant. A one unit increase in TBT will increase import value by about 0.2%. China's TBT are trade restricting for agriculture goods but trade promoting for manufacturing goods. Frequency index measure shows that TBT has a negative impact on overall China's imports.

Bao and Qiu (2012) also estimate the trade effects of TBT based on WTO members during 1995-2008. They adopt a modified two-stage gravity model. The results of Probit model and Maximum Likelihood method and the non-linear least squares (NLS) estimation shows that the TBT effects are different depending on the country's economic development level. It was found that a country's TBT notifications decrease other countries' probability of exporting, but increase their export volumes. Using TBT developed country can restrict imports from developing country and on other hand their export volume improves. It was further found that a developing country's TBT have significant effects on other developing countries' exports, but no significant effects on the developed countries' exports. A developed country's TBT have significant and major effect on developed countries' export.

According to World Trade Report (2012) NTBs are widely used by different countries and vary across countries, and TBT were used as tool of NTBs. For estimation an ad-valorem tariff equivalent (AVE) is used for quantification the impact of NTMs on international trade. Methodology used for estimating the AVE of NTMs is Price gap method. The result shows that NTMs effect on overall trade restrictiveness is significant, and in some estimates NTBs are far more trade restrictive than tariffs. TBT have positive trade effects on more technologically advanced sectors, but negative effects in agricultural sectors. It was identified that different types of TBT have a negative effect on export market diversification.

Alaeibakhsh and Ardakani (2012) quantify the trade effect of technical regulations agreement on export of Iran. Gravity model was used that shows negative relationship of these measurements on exports of agriculture sector. Due to lack of TBT conditions

fulfill by country reduced their import especially to Europe Union members. They suggested that if Iran builds up-to-date production systems, it will increase its exports.

Kayani and Shah (2014) investigate the effects of NTBs on Pakistan's export with India, China and Sri Lanka. Their study shows that China, India, and Sri Lanka have more NTBs than Pakistan. China and India have particularly sophisticated NTBs. Pakistan's NTBs protect well-established rent seekers, such as agriculturalists. Indian and Chinese NTBs protect strategic industries, such as small businesses, defense contractors, and electronics manufacturers. Pakistani NTBs operate as bans that shut competitors out of the Pakistani market, Indian and Chinese NTBs create costs that make foreign products more expensive to their consumers. Foreign businesses can at least compete with Chinese and Indian businesses on unequal terms, and provide local businesses with some incentive to improve.

Arita et al., (2015) estimate the effects of TBT on agricultural trade between USA and EU. Gravity model was used to quantify the extent of protection. Most of the commodities affected by TBT, estimated ad valorem tariff equivalents (AVE) of NTMs were found to be considerably higher than existing tariffs. The AVE effect of USA NTMs on EU export decline ranges from 37 percent for vegetables to 45 percent for fruits.

Besedina (2015) investigate the effect of TBTs on the degree of export diversification at firm, product and market level in the sectors affected by such measures. According to the heterogeneous firms trade theory commenced with Melitz model any additional cost of exporting will force some of the firms to stop exporting, thus reducing the number of exporting firms and products exported. There results show almost no effect because aggregate dynamic variables may not capture well changes in behavior of economic agents (firms). While marginal firms may be affected by technical barriers averaging across firms may actually hide this. Second, the effect of the introduction of an NTM measure may not be felt immediately (in one year). Monetary costs and more complicated exporting procedures seem to hamper product and market diversification.

According to Strategic Trade Policy Framework 2015-18, due to use of inefficient technologies Pakistan's exports of selected sectors i.e., fans, home appliances, rice, cutlery and sports goods are not increasing. So in order to up gradation of technology some investment support and markup support programs 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 & Technology, Commerce and National Food Security & Research will be constituted to work on quality standardization and harmonization of Pakistan standards besides, revision of list of pre-shipment inspection companies. There is considerable potential for



increase in export to China in the short-term through strategic interventions (Ministry of Commerce GoP, 2016).

Ali (2016) empirically examines a connection between NTMs and trade response at micro level. It investigates the mechanism, drivers and speed of adjustment of TBT. It uses an administrative dataset of Pakistan's mango-exporting firms at an HS-8 digit level. The research finds the NTMs appear to have increased the volume of exports but through one specific channel and after some time lag. The intensive margins of trade have improved whereas the extensive margins have reduced. The increase in intensive margins is, however, registered after a gap of four years and appears to be driven by larger quantities as well as higher prices. The reduction in the extensive margins seems to operate mainly through a reduction in the number of customers in export markets.

### **Empirical Strategy, Model and Methodology**

This section presents the model that provides the bases for estimation through Tobit regression. Furthermore, two approaches are explained to analyze the quantitative investigation of TBT. We used Tobit model to study Pakistan and China trade and TBT effect on Pakistan's exports to China. In particular, we introduced our constructed TBT variables to examine how TBT by China influences Pakistan's export. In this model, we include GDP of both countries, exchange rate, coverage ratio and frequency index. GDP of China captures the effect of the China's huge GDP size. We used real GDP of Pakistan to proxy its supply size and real GDP of China (importing country) to proxy its demand capacity. Aside from this model, we also added our core variables, coverage ratio and frequency index. Main regression model takes the following form:

$$EXd_t^k = a_1 FI_t^k + a_2 ECR_t^k + a_3 \ln ER_t + a_4 \ln GDPP_t + a_5 \ln GDPC_t + \varepsilon$$

Where the explanatory and explained industry level variables are defined as follows:

$EXd_t^k$  is dummy variable representing Pakistan's exports to China in year  $t$ , equals 1 if export exists, and 0 otherwise

$FI_t^k$  is the frequency index of Pakistan's TBT applied to product  $k$  in year  $t$

$ECR_t^k$  is the export coverage ratio of Pakistan's TBT applied to product  $k$  in year  $t$

$\ln ER_t$  is Pakistan's exchange rate in year  $t$

$\ln GDPP_t$  and  $\ln GDPC_t$  are Pakistan's and China's real GDP in year  $t$ , respectively.

In our sample, Pakistan is exporting country, whereas China is importing country of all industrial level products at HS 2. The data covers time span during 2002-2015, 2002 is date of China's entry into WTO, while Pakistan has already joined WTO in 1995. We suppressed constant term because large number of zero in dependent variable may affect other coefficients. Data on Pakistan's export to China is collected from UN Comtrade, TBT data from WTO, and exchange rate and GDP data collected from world development indicators (WDI) of the World Bank.

Johnston and DiNardo (2011) defined a probit model as if a variable  $y^*$  which an index of one's desire for something (export from Pakistan, in our case), as define variable  $y_i$  that equals 1 (if Pakistan's export to China exists) and 0 otherwise. Formally writers defined it as

$$y^* = X_i\beta + \varepsilon_i$$

$$\text{Where } \varepsilon \sim N(0, \sigma^2), \text{ and } y_i = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases}$$

Suppose if instead of observing merely the decision to export something, we have information on actual export of merchandise. The extension of probit is called the Tobit<sup>5</sup> (Tobin's probit) and is defined by following:

$$y_i = \begin{cases} y^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases}$$

This model is called a censored regression model because it's possible to view the problem as one where observations of  $y^*$  at or below zero are censored; so the model can be reformed as:

$$y_i = \max(0, X_i\beta + \varepsilon_i)$$

Our explanatory variables: export coverage ratio (ECR) and frequency index are reviewed by Bora, et al. (2002), so we used to quantify TBT effects on Pakistan's export to China. The export coverage ratio covers the extent of export covered by enforcement of TBT. The ratio of TBT in Pakistan for product category j in a year is the percentage of export by Pakistan in product category j which is affected by China's TBT in respective year, and denoted by

$$ECR_j = \frac{\sum_i D_i V_i}{\sum_i V_i} \times 100$$

where i is export good contained in product category j (HS 2). If TBT is enforced to good i, the dummy variable  $D_i$  take value one if TBT is enforced and zero otherwise.  $V_i$

<sup>5</sup> Tobin developed this model in his paper "Estimation of relationships for limited dependent variables," *Econometrics*, 1958

is the value of good  $i$ 's exported by Pakistan to China. Thus, the coverage ratio of good category  $j$  is higher if more of goods are subject to TBT scrutiny and/or the goods under TBT have larger exports values.

However, there is a difficulty with the coverage ratio: the endogeneity of weights in export values. In extreme, if TBT 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.

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

$$FI_j = \frac{\sum_i D_i E_i}{\sum_i E_i} \times 100$$

where  $i$  is export good contained in product category  $j$  (HS 2). If TBT 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, hence cannot provide any indication of the relative importance of the TBT among all good items in good category  $j$ .

Frequency index measures the number of goods subject to TBT 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.

Frequency index measures the proportion of good (HS 09) covered by TBT within good category (e.g. HS 4), which varies between zero (means no coverage) and 100 percent (all goods are covered). For example, in case of HS 09 (i.e., wood, cork and articles; basketware), there are 3 goods at HS 4 level [i.e., HS 0944 (wood and articles of wood; wood charcoal), HS 0945 (cork and articles of cork), and HS 0946 (manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork)], and only 1 of 3 (HS 0944) is covered by TBT. Hence, frequency index will be 33.33% (1/3).

Export coverage ratio gives the proportion of affected export within a good category (HS 2. Let us take HS 17 (vehicles, aircraft and vessels). It has 4 goods (at HS 4 level), HS1786, HS1787, HS1788, and HS1789 with a total export value of US\$0.664665 million. One good (HS 1787) is covered by TBT (denoted by  $D_i$ ), with export of US\$ 0.425143 million (denoted by  $V_i$ ). So the coverage ratio of HS17 is equal to 63.95% ( $=0.425143/0.664665$ ).

Pakistan has zero export in many products to China. Accordingly, we use Tobit estimation (censored regression model) to deal with the censorship problem because of the many zero export observations in dependent variable.

### Empirical Results and Discussion

Table 1 demonstrates the summary statistics of the explained and independent variables. Table 2 shows the coefficient of the trade control measure variables and other variables. ECR-T and FI-T are positively correlated (0.9337) which depicts that both measures coverage ratio and frequency index are alternative measures to quantify the technical barriers to trade.

Table 1: Summary Statistics of Key Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
EXd	308	.6363636	.4818285	0	1
ER	308	4.319272	.2249313	4.056123	4.632493
ECR-TBT	308	7.679969	25.74632	0	100
FI-TBT	308	7.938312	24.35035	0	100
GDP-C	308	8.241314	.3664799	7.626484	8.766579
GDP-P	308	6.926099	.0820113	6.754333	7.049377

Table 2: Coefficient correlation between variables

	EXd	ER	ECR-TBT	FI-TBT	GDP-C	GDP-P
EXd	1.00					
ER	0.1191	1.00				
ECR-TBT	0.2259	0.1370	1.00			
FI-TBT	0.2468	0.1482	<b>0.9337</b>	1.00		
GDP-C	0.1862	0.9521	0.1685	0.1767	1.00	
GDP-P	0.2246	0.8093	0.1580	0.1672	0.9415	1.00

As data shows that Pakistan has no export of many products to China. Therefore we use Tobit estimation procedure to deal with censorship problem, because industry level export data (explained variable) include many zero values<sup>6</sup>.

Tobit regression estimation results based on HS 2 and HS 4 products are presented in Table 3. The results show from the basic model in equation. The GDP of China has positive effect on

<sup>6</sup> Among the 308 observations, 112 observations have zero trade and account for about 36% of the whole sample.

Pakistan's export (1% increase in China's GDP raises export 1.88% from Pakistan to China). The coefficient of this variable is strongly significant and as per expected sign. Coverage ratio has trade restrictive effect (negative as expected, but insignificant effect) on Pakistan export to China during 2002-2015. On the other side, frequency index (FIT) depicts that 1 unit increase in TBT will increase export value by 0.75%. Ali (2014) also found similar results, that TBT compliance has impacted positively the textiles export of Pakistan. The exchange rate of Pakistan has negative effect on Pakistan's export (1% increase in Pakistan exchange rate decreases export 2.38% from Pakistan to China).

Table 3: Tobit Regression Results by using Frequency Index and Coverage Ratio

Indep. Var.	Coef.	Robust Std. Err.	t	P> t	Remarks
ER	-2.3750950	.6335885	-3.75	0.000	Significant
ECR-TBT	-0.0018885	.0015821	-1.19	0.234	Insignificant
FI-TBT	0.0075143	.0017342	4.33	0.000	Significant
GDP-C	1.8765820	.444931	4.22	0.000	Significant
GDP-P	-0.6891507	.2124628	-3.24	0.001	Significant
Total observations = 308			F( 5, 303) = 322.03		
Left censored obs. = 112			Prob > F = 0.0000		
Uncensored obs. = 196			Robust Std. Err.		
Log pseudolikelihood = -302.48364					

The Tobit regression results show that the GDP of Pakistan has negative effect on Pakistan's export to China (1% increase in Pakistan's GDP decreases export 0.689% from Pakistan to China). Supporting this result, Irshad (2016) also found similar results. He studied Pakistan and China free trade agreement – 2007. He explained that “the trade patterns have improved (Pakistan exports as well as imports from China have increased) but the trade deficit of Pakistan has also increased; the Revealed Comparative Advantage and SWOT analysis shows that there is a difference in goods traded by both countries in world markets and bilaterally except the top ranked products. Conversely, Pakistan's GDP does not have much influence on its exports to China. Therefore, in present conditions, Pakistan benefits more from the bilateral trade because its' exports to China are positively correlated with China's GDP, which is growing faster than Pakistan's GDP”.

A proxy variable GDP of China is used to analyze demand of Pakistani exports shows trade promotion effect, this is factual by looking at increasing GDP of China and Pakistan's export increase to China in Figure 1 and Table 6. Export coverage ratio quantifies TBT effects and it captures the extent of export covered by enforcement of TBT. The results as per sign of coefficient of variable confirm the theory in case of Pakistan's export. We also measured margin effects of the trade which is important as well, and which explains the effects on the margin, shown in Table 4.

## Conclusion

The present research study empirically analyzes the TBT enforcement by China on export from Pakistan under WTO regime using industry level data during 2002-2015. Using 4-digit HS code dataset, we employed coverage ratio and frequency index to estimate Tobit regression equation. It is found that when coverage ratio is used TBT had trade restrictive effects during study period. On the other hand, when frequency index is used we analyzed that TBT enforcement promoting export from Pakistan. In most of researches TBT restricts trade in short run, but a trade promoting effect in long run. Moreover, result shows that increasing GDP of China revitalizing export of Pakistan as well. Previous researches on revealed comparative advantage proved that Pakistan has more potential to increase export. But NTMs like TBT may divert trade pattern. Under CPEC implementation, capacity building of PSQCA and other stockholders in Pakistan can be increased by SAC and AQSIQ of China. This will help domestic exporters and manufacturers to better equip themselves for enforcement of TBT and other NTMs. Pakistan has signed number of MoUs for skill enhancement by Chinese experts under CPEC regime. Moreover, we may get benefit from gigantic GDP size by increasing export to China. We expect that as more data set will be available on TBT by WTO sources, more dimensions of TBT enforcement can be analyzed in Pakistan.

## References

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

Ali, S. (2016). *Export response to sanitary and phytosanitary measures and technical barriers to trade: Firm-level evidence from a developing country*, CREDIT Research Paper, Centre for Research in Economic Development and International Trade, UK, University of Nottingham.

Ali, S., Sajid, A., & Shah, S. (2014). The impact of technical barrier to trade on Pakistan textile industry, *Pakistan Journal of Science*, 66(2).

Arita, S., Mitchell, L., & Beckman, J. (2015). *Estimating the effects of selected sanitary and phytosanitary measures and technical barriers to trade on U.S.-EU agricultural trade*. ERR-199, U.S. Department of Agriculture, Economic Research Service.

Besedina, E. (2015). *Technical barriers to trade and SPS measures and export dynamics*. NUPI Working Paper 842, Norway: Norwegian Institute of International Affairs.

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

Bao, X., & Qiu, L. (2012). How do technical barriers to trade influence trade? *Review of International Economic*, 20(4).

Bora, B., Kuwahara, A. & Laird, S. (2002). *Quantification of non-tariff measures, policy issues in international trade and commodities*. Study Series No. 18, Division on International Trade in Goods and Services, and Commodities, Switzerland: United Nations Conference on Trade and Development (UNCTAD).

Chen, M., Otsuki, T. & Wilson, J. (2006). *Do standards matter for export success?* World Bank Policy Research Working Paper 3809 .

Disdier, A., Fekadu, B., Murillo, C., & Wong, S. (2008). *Trade effects of SPS and TBT measures on tropical and diversification products*. ICTSD Project on Tropical Products, Issue Paper No. 12, Switzerland: International Centre for Trade and Sustainable Development.

Irshad, M., Xin, Q. & Arshad, H. (2016). SWOT Analysis of Pakistan-China free trade agreement: Pros and cons. *International Journal of Asian Social Science*, 7(1).

Johnston, J. & DiNardo, J. (2011). *Econometric Methods*, 4<sup>th</sup> edition, McGraw-Hill.

Maskus, K. & Wilson, J. (2001). *Quantifying the impact of technical barriers to trade: A review of past attempts and the new policy context*. Paper prepared for the World Bank Workshop on "Quantifying the Trade Effect of Standards and Technical Barriers: Is it Possible?" April 27, 2000, Development Research Group (DECRG), USA: The World Bank.

Ministry of Commerce (2016). *Strategic Trade Policy Framework 2015-18*. Pakistan: Government of Pakistan.

Shabbir, S. & Kazmi, R. (2007). Economic effects of the recently signed Pak-China free trade agreement, *The Lahore Journal of Economics, Special Issue*.

Shah, S., Sajid, A. & Ali, S. (2014). The impact of technical barrier to trade on Pakistan textile industry. *Pakistan Journal of Science*, 66(2).

Staiger, R. (2012). *Non-tariff measures and the WTO*, Staff Working Paper ERSD-2012-01, Economic Research and Statistics Division, World Trade Organisation.

Kayani, U. and Shah, S. (2014). *Non tariff barriers and Pakistan regional trade*. Working Paper, International Growth Centre, Pakistan: Lahore University of Management Sciences.

World Trade Report (2012). *The trade effects of non-tariff measures and services measures*. The World Bank.

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

WTO (2016). *Twenty-First Annual Review of the Implementation of the Operation of the TBT Agreement*. Switzerland: World Trade Organization.



**Table 4: Marginal effects of trade control measures: frequency index and coverage ratio**

Marginal effects after Tobit				Number of obs. = 308
Y = Linear prediction (predict)				
= 0.4788469				
Variable	dy/dx	Std. Err.	z	P> z
ER	-2.375095	.63359	-3.75	0.000
ECR-TBT	-.0018885	.00158	-1.19	0.233
FI-TBT	.0075143	.00173	4.33	0.000
GDP-C	1.876582	.44493	4.22	0.000
GDP-P	-.6891507	.21246	-3.24	0.001

**Table 5: Frequency of TBT enforced by China on Pakistan's Export**

HS Code	Description	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
0	Measures without HS code	1	1			1	2	5	1		4
101	Live animals						1				
103	Fish, crustaceans, mollusks, aquatic invertebrates						1				
206	Live trees, plants, bulbs, roots, cut flowers etc						1				
207	Edible vegetables and certain roots and tubers						1				
208	Edible fruit, nuts, peel of citrus fruit, melons						1				
209	Coffee, tea, mate and spices				1		1				
210	Cereals						1				
211	Milling products, malt, starches, inulin, wheat glute						1				
212	Oil seed, oleagic fruits, grain, seed, fruit, etc, ne						1				
421	Miscellaneous edible preparations				1						
423	Residues, wastes of food industry, animal fodder						1				1
424	Tobacco and manufactured tobacco substitutes	1			1		1				
629	Organic chemicals										1
631	Fertilizers						1				1
636	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations				1						
638	Miscellaneous chemical products			1			1	1			
739	Plastics and articles thereof			1	2						
740	Rubber and articles thereof			1	2			1			
944	Wood and articles of wood, wood			1							

	charcoal										
1150	Silk			1							
1151	Wool, animal hair, horsehair yarn and fabric thereof			1							
1152	Cotton			1							
1153	Vegetable textile fibres; paper yarn and woven fabrics of paper yarn			1							
1154	Man-made filaments; strip and textile materials			1							
1155	Man-made staple fibres			1							
1264	Footwear, gaiters and the like; parts of such articles							1			
1368	Articles of stone, plaster, cement, asbestos, mica or similar materials			2							
1369	Ceramic products			1							
1370	Glass and glassware			1				1			
1572	Iron and steel			1	1						
1573	Articles of iron or steel			3	1						
1574	Copper and articles thereof			1							
1582	Miscellaneous articles of base metal				1			1			
1684	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles			1				1			3
1685	Railway, rolling stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electromechanical) traffic signalling equipment			1				1		1	1
1787	Aircraft, spacecraft, and parts thereof			1				1	2		2
1788	Ships, boats and floating structures										1
1890	Clocks and watches and parts thereof			1				1			
1993	Arms and ammunition; parts and accessories thereof							1			
2094	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated buildings			2					1		

Data source: WTO, 2016

**Table 6: Pakistan Top 20 Exports to China (US\$)**

HS Code	Commodity	2003	2015	% change
1152	Cotton	169,010,892	1,261,711,297	87
0210	Cereals	71,648	167,049,741	100
0525	Salt; sulphur; earths and stone; plastering materials, lime and cement	1,648,410	47,977,317	97
0103	Fish and crustaceans, molluscs and other aquatic invertebrates	20,121,963	46,167,960	56
1574	Copper and articles thereof	0	27,999,221	100
0208	Edible fruit and nuts; peel of citrus fruit or melons	106,871	26,844,651	100
0739	Plastics and articles thereof	5,920,768	23,341,291	75
1890	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	334,043	8,501,224	96
0423	Residues and waste from the food industries; prepared animal fodder	0	7,027,002	100
1155	Man-made staple fibres	1,116,431	4,372,493	74
1684	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	1,161,293	3,503,289	67
1582	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	979,655	2,975,841	67
1368	Articles of stone, plaster, cement, asbestos, mica or similar materials	185,069	2,597,768	93
0212	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	1,171,701	2,108,040	44
1685	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	47,696	2,012,547	98
1573	Articles of iron or steel	39,057	980,590	96
0207	Edible vegetables and certain roots and tubers	67,034	922,890	93
2094	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated buildings	21,903	788,098	97
1154	Man-made filaments; strip and the like of man-made textile materials	2,912,037	506,208	-475
0629	organic chemicals	26,624,953	298,692	-8814

**Table 7: Restiveness of Export Measures by TBT in Pakistan**

Year	No. of affected products (1)	Restrictiveness = (1)/ Total No. of products	Affected exports 000 US\$ (2)	Total Exports 000 US\$	Restrictiveness = (2) / Total Exports thousand US\$
2002	0	0.00%	0	0	0.00%
2003	0	0.00%	0	232693425	0.00%
2004	0	0.00%	0	250221415	0.00%
2005	2	2.06%	0	368321920	0.00%
2006	0	0.00%	0	433460418	0.00%
2007	1	1.03%	0	469146016	0.00%
2008	21	21.65%	438671936	498676667	87.97%
2009	9	9.28%	24348759	863137360	2.82%
2010	1	1.03%	0	1151275582	0.00%
2011	18	18.56%	91669222	1417159025	6.47%
2012	9	9.28%	2601397	2338791951	0.11%
2013	1	1.03%	0	2367776498	0.00%
2014	1	1.03%	1891889	1982133402	0.10%
2015	8	8.25%	13180555	1639307976	0.80%

Data source: WTO, 2016