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Non-tariff Measures, Overall Protection, and Export Competitiveness: Evidence from Pakistan and Regional Countries

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ABSTRACT

Pakistan's exports have stagnated since 2013 after growing significantly during the previous decade. While many other factors have undoubtedly contributed, the evidence outlined in this paper indicates that the substantial increase in overall protection, driven by incidence of non-tariff measures, has had a major and decisive impact.

The paper investigates the incidence and intensity of nontariff measures (NTMs) in Pakistan from 1967–2015, based on trade theory. The study follows the methodology developed by Kee, et al. (2009) and adopted by Niu, et al. (2018) to calculate ad valorem equivalent (AVE) of NTMs and overall trade protection in combination with tariffs. Our results show that the incidence and intensity of core NTMs, and with-it overall protection increased substantially over time, especially after 2013, even though tariffs continued to decline over this period. Overall protection rose from about 18 percent in 2003 to 68 percent in 2015 at a time when the average tariff rate had declined to 12.7 percent and with the tariff equivalent of NTMs, contributing the balance 55 percent. Our results confirm that the increase in overall trade protection in Pakistan is dominated by core NTM protection. The average AVEs of NTMs increased from 1 percent in 2003 to 55 percent in 2015. This increase is much higher as compared to regional comparator countries.

The research serves as an important policy tool by giving a convincing explanation that the substantial increase in overall protection driven by NTM protection is one of the crucial factors which contributes to the export stagflation in Pakistan. To enhance the competitiveness of Pakistan's exports, reducing tariffs, which are among the highest in the world, will undoubtedly help, but what this paper is presenting is the urgent need to manage and reduce the impact of NTMs, which dominate overall protection, by reassessing their necessity and coverage, and by streamlining the regulatory process and harmonizing it with trading partners. This will also help to reduce the impact on domestic prices and, with it, ease inflationary pressures, a major concern of policy-makers.

1. CONTEXT AND RATIONALE

Pakistan's exports have largely remained unchanged in value terms since 2013 after rising significantly in the previous decade. In the fiscal year 2013 exports of goods and services reached US$30.4 billion, being the highest since the 2008 financial crisis. However, Pakistan witnessed a significant decline in subsequent years. Overall, there has been no significant change in the value of exports in the last decade (Figure 1).

Fig. 1. Pakistan Exports of Goods and Services (US$ m) FY 2003–2019
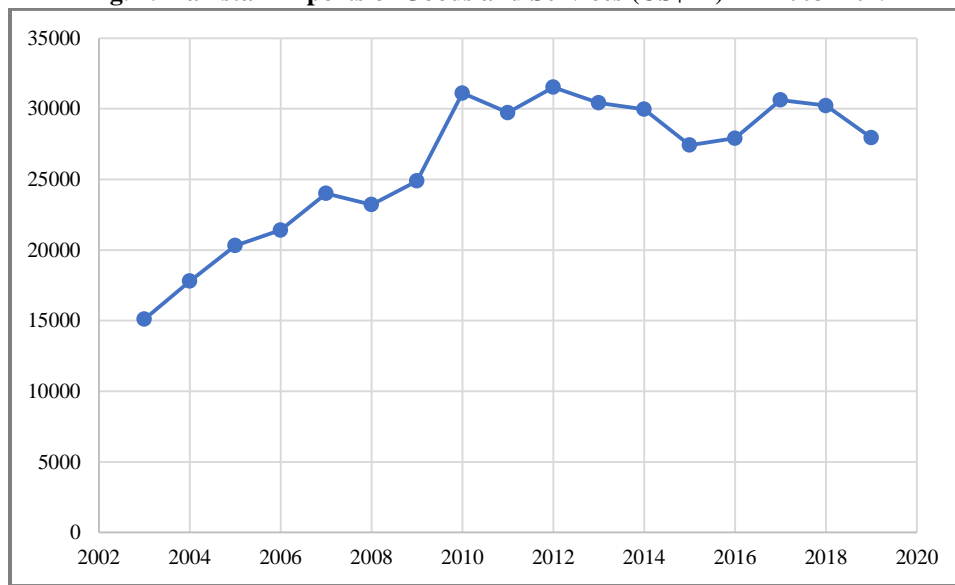
Source: Author's calculation based on World Bank Data.

The stagnation in Pakistan's export performance has been accompanied by weak performance relative to comparators. Exports of goods and services in value terms by Pakistan increased by 50 percent between 2005 and 2017, from US$ 20.3 billion to US$ 30.2 billion. This compares with 165 percent growth in total exports by the South Asia Region as a whole, 136 percent by Thailand, and 519 percent by Vietnam [1] (Figure 2). Bangladesh's exports, which were about the same as Pakistan in 2005, were US$ 47 bn in FY2018, 50 percent higher than Pakistan, US$ 30.6 billion.

Fig. 2. Pakistan's Exports Compared to Peers, 2005–2017

Source: United Nations Conference on Trade and Development (UNCTAD).
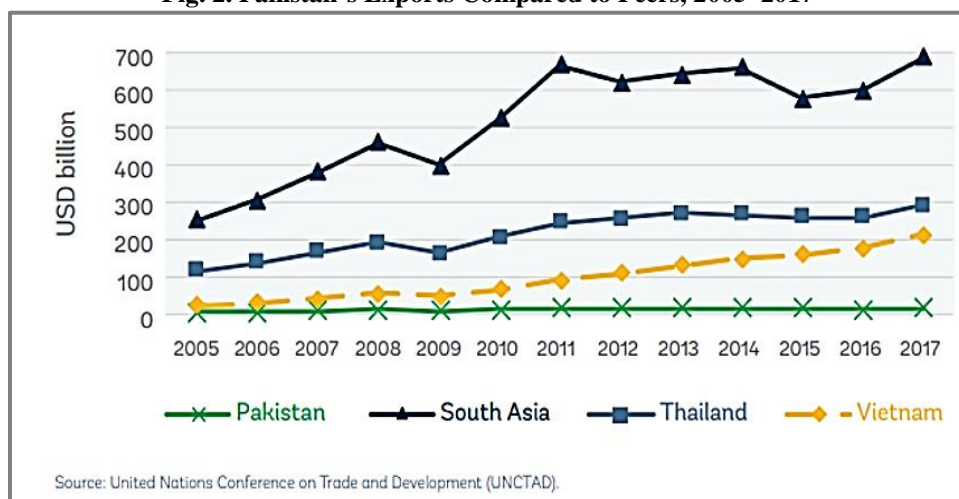
The lack of growth in exports has contributed to lower growth prospects and macroeconomic imbalances. Between 2008 and 2017, Pakistan's GDP rose at an annual growth rate of 3.7 percent while South Asian countries' GDP grew by 6.6 percent. As exports have stagnated, low reserves have triggered IMF programs repeatedly in the past (Figure 3). Without substantial and sustained growth in export earnings, foreign exchange reserves have been insufficient to provide an adequate buffer to cope with global and internal shocks and debt servicing.

Fig. 3. Pakistan's Foreign Exchange Reserves in US$ Billion

Source: SBP
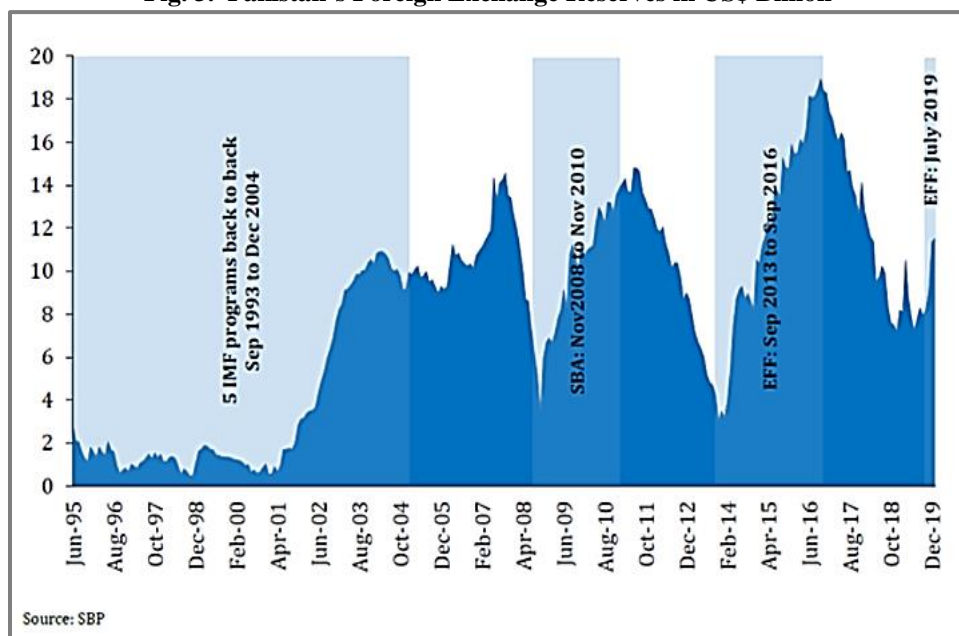
Fig. 4. Pakistan: Real Effective Exchange Rate Index 2010=100

Source: State Bank of Pakistan/Haver Analytics
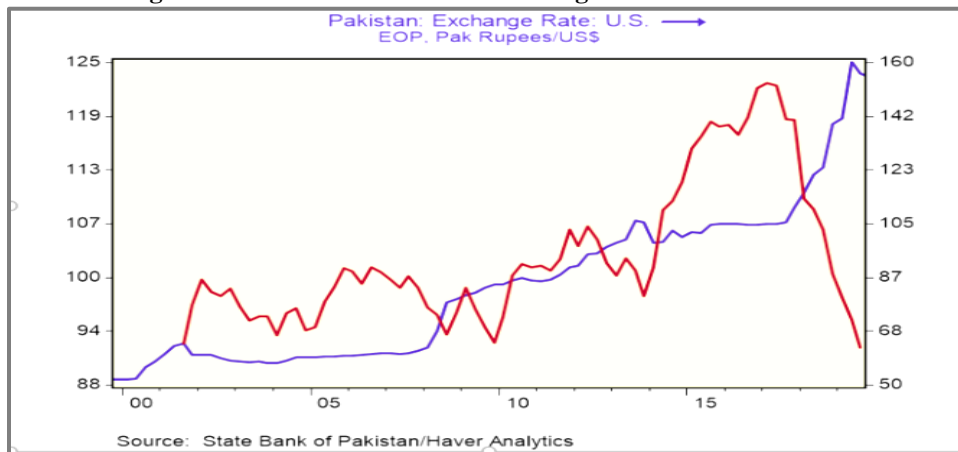
Although many factors are contributing to the stagnation in Pakistan's past exports a major reason for the poor past performance in exports is a protectionist trade policy as reflected in high tariffs.[2][3] The argument being made is that such a policy created an anti-export bias suppressing the growth of exports.

Average tariffs (or import duties) in Pakistan were 12.58 percent in 2018, some of the highest in world. They are high, even compared to other protectionist countries. These tariffs (customs duties) are about two-times higher than the world average and three times those in East Asia and the Pacific. According to the Overall Trade Restrictiveness Index (OTRI) provided by the World Bank, Pakistan is the 7th most protected economy in the world.

Tariffs play a dual role which explains the difficulty of reducing them. They are an important source of revenues for the government; in FY19, revenues from customs duties and trade-related regulatory taxes contributed 16 percent to tax revenues. This is above the average for countries with a similar income per capita.

The second role, protection, allows the government to use tariffs as a tool to allocate resources and impacts export competitiveness. Tariffs create a gap between the world price of a product and its domestic price and that of local substitutes, affecting resource allocation both in terms of production and consumption by raising the price of imported goods relative to those produced locally. This distortion creates incentives to allocate resources into the domestic economy rather than for production for export markets where they would get world prices that are lower than in local markets. Hence the creation of a bias against exports with the duty on imports effectively becoming a tax on exports.[4]

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[2] Overvalued real and nominal exchange rate, an outdated trade policy, regulatory policies affecting the business environment, policy on trade services, and trade facilitation, logistics, and weakness in infrastructure.

[3] See Pakistan Economic Survey (2019) and "Pakistan Trade Strategy Development and Modernising Trade in Pakistan: A Policy Reform Handbook" World Bank, September 2019 (pages 18-19). The Handbook also argues (Pg. 19) that stagnant exports were due to an over-valued real exchange rate. This is questionable, at least in the short run, as Pakistan's exports in the first 8 months of FY 2019 before the onset of Covid-19 increased only 1.1 percent despite a large devaluation (Figure 4).

[4] "Economic Policy for Competitiveness Import Duties and Performance – Some Stylised Facts for Pakistan", World Bank, May 2020

Pakistan also has a high differential between tariffs on consumer goods and raw materials and between intermediate goods and raw materials relative to more open economies in the East Asia Region which participate successfully in global value Chains. This creates the well-known cascading effect and, with it, high effective rates of protection in many of Pakistan's manufacturing sectors. (see Figure 4).[5]

Fig. 4. Tariff Cascading by Country/Region, 2018 or Last Available Year

Source: World Bank, May 2020
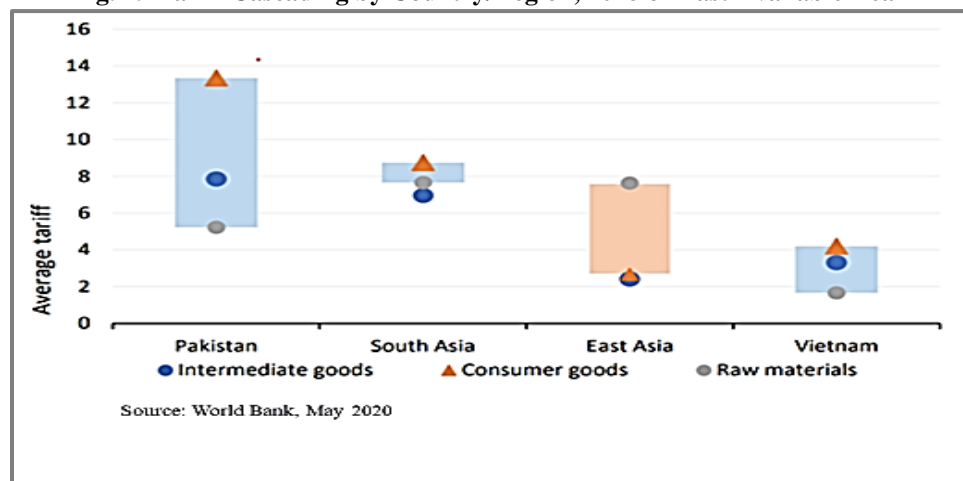
What is important to note in Figure 4 is even after cascading the maximum tariff on consumer goods averages about 13 percent. This becomes relevant in our subsequent discussions and the importance of NTMs

1.1. The Role and Importance of Non-Tariff Measures for Trade

The internationally accepted definition of NTMs is that they are "policy measures other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, change in quantities traded, or prices or both (UNCTAD 2010)".

The following note taken from World Bank and UNCTAD provides a clear explanation of what measures are included under the definition of NTMs, implications of introducing these essentially regulatory measures on trade and our daily lives, the difference between NTMs and traditional trade measures such as quotas, and the role of NTMs in sustainable development.

The definition of NTMS covers "a broad range of policy instruments including traditional trade policy instruments, such as quotas or price controls, as well as regulatory and technical measures that stem from important non-trade objectives related to health and environmental protection (Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT)).

The concept of NTMs is neutral and does not necessarily imply a negative impact on trade. Some NTMs might even have a positive impact on trade, though many NTMs are thought to have important restrictive and/or distortionary effects on international trade

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[5] Op Cit

regardless of whether they are applied with protectionist intent or to address legitimate objectives, such as protecting health or safety, or the environment.

Most traded goods are affected by non-tariff measures. The majority of NTMs are regulatory measures while traditional trade measures such as quotas and non-automatic licensing are now less common. Since most regulations apply equally to domestic products, NTMs affect most of the products that we encounter in our daily lives: packaging requirements and limits on the use of pesticides ensure safe food; restrictions on toxins in toys protect our children; mandatory voltage standards for household plugs enable regional mobility, and emission standards for cars limit climate change.

While tariffs are clear in their intent, the role of NTMs is less straightforward. On the one hand, many regulatory NTMs are indispensable for sustainable development. They aim to protect human, animal, or plant health as well as the environment. These objectives are at the core of social and environmental sustainability policies and the measures are legitimate tools in countries' efforts to achieve the Sustainable Development Goals. On the other hand, NTMs can also raise costs and create hurdles for trade and economic development. Private sector surveys indicate that technical regulations as well as related processes pose a significant challenge for trade. (World Bank, UNCTAD (2018): The unseen impact of nontariff measures: Insights from a new database.)"

Annex 1 provides the standard definition and classification of NTMs provided by UNCTAD.

A robust regulatory framework at the national and international levels can reduce the adverse effect of NTMs on trade. For example, regulatory bodies can harmonise protection policies in all countries. The cost of compliance is higher for developing countries as compared to high-income countries. Reduction in the cost of processing the regulatory requirements may reduce the adverse effect of NTMs.

2. LITERATURE REVIEW

In this section, we discuss the recent development in research related to NTMs as one of the indicators of trade protection. NTMs provide a significant measure of trade restrictiveness. The assessment of NTMs has been limited because of identification and measurement problems. Much of the past research on NTMs has been done in the form of simple indicators, which lack theoretical underpinning, or aggregate measures that fail to capture actual trade protection policies (Niu, et al. 2018, p. 676). One of the first studies to develop a quantitative methodology for defining and measuring the AVEs of NTMs (or, Tariff equivalent of NTMs) based on the sound theoretical concept, that allows an assessment of overall protection and comparison with the tariff is that of Kee, et al. (2009). In the case of Pakistan also, there is a dearth of studies discussing the AVEs of NTMs as a measure of trade protection in general and especially using trade theory-based methodology outlined in Kee, et al. (2009). Our paper intends to fill this gap.

Kee, et al. (2009) estimate AVEs of NTMs, as a measure of trade restrictiveness indices. They were the first to develop an empirical model based on the sound theoretical work of Anderson and Neary (1992; 1994; 1996; 2003; 2007). Kee, et al. (2009) measure the restrictiveness indices using AVEs of NTBs for 87 countries.[6] The main finding of

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[6] At the time of writing of Kee et al. (2009), the UNCTAD -MAST definition and classification of NTMs didn't exist, which came in 2010.

this study is that contribution of NTBs to trade restrictiveness, in most countries, is more than that of the tariff. Their results also show that low-income countries have a more restrictive trade regime and face a higher barrier to exports relative to developed countries. Kee, et al. (2009) also investigate the issue of whether the NTBs and tariffs are substitutes for each other. They conclude that after they control for country and product fixed effects, tariffs and AVEs of core NTBs were substitutes to each other.[7] Kee and Nicita (2016) also come to a similar conclusion that AVEs of NTMs and tariffs are substitutes. They highlight the importance of considering the AVEs of NTMs in multilateral trade negotiations.

A shortcoming of the study by Kee, et al. (2009) is that it uses data from a single period 2002, covering 87 countries that do not include Pakistan. Therefore, this study was unable to explain the evolution of protection from NTMs over time and the outcome for Pakistan. The study by Niu, et al. (2018) overcomes these shortcomings.

Niu, et al (2018) build on the work of Kee, et al. (2009) and estimates the AVEs of NTM using discrete data at 3 years intervals, from 1997-2015. Niu, et al. (2018) use a newly constructed database, UNCTAD-TRAINS, and estimate the NTMs in a consistent manner over time for 97 countries, including Pakistan.[8] Like Kee et al. (2009), they also conclude that the evolution of overall protection is dominated by NTM protection and not by tariffs. Niu et al. (2018) also looked at the aftermath of the financial crisis 2008 and found that that AVEs and overall protection increased in the wake of 2008 financial crisis. Although Kee et al (2009) and Niu et al (2018) both conclude that in general low-income countries have the highest level of NTMs protection, they do not provide details of the overall protection of individual countries.

Niu, et al. (2009) also addressed the question of how AVE of NTMs changed in the wake of the trend towards the global liberalisation and gradual reduction in tariff, especially after the Global Financial Crisis 2008. Using frequency indices, they find that the overall incidence of core NTMs increased over the period and technical measures were the most widely applied NTMs each year, followed by quantitative restrictions. The incidence of price control and monopolistic measures were relatively low. They conclude that overall protection was on the rise despite the gradual trade liberalisation, associated with the reduction of tariffs.

Researchers use different data and econometric methods to estimate AVEs of NTMs. Kee, et al. (2009) and Niu et al (2018) estimate the AVEs using import values evaluated at exogeneous world prices, which are normalised to unity. This makes import quantities equal import value.[9] Kee and Nicita (2016) use bilateral trade data, using a gravity model with quantity of imports as the dependent variable. Cadot et al (2018) estimate trade effects of NTMs, separating price effects from volume effects, and assert that price-based effects can facilitate trade but the trade cost of NTMs often reduces trade

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[7] Kee et al (2009) mention, that as anecdotally reported, constraints imposed by international or bilateral trade agreements on government ability to set tariffs may induce some countries to replace tariff by more restrictive NTBs (and vice versa) P.186

[8] Kee et al. (2009) use UNCTAD's old system of classification of NTM, called TCMS while Niu et al. (2018) use a new system of classification, i.e., UNCTAD-MAST (see Annex-i for details).

[9] We interpret the objective of normalisation is to render the results more interpretable. Estimation is unaffected. The normalisation has the impact of changing the units in which output is measured. Doing that quantities and values become equal in terms of numerical values.

volume. The price-based estimation results show that NTMs reduce information asymmetries and enhancing consumers 'confidence in imported products. The volume-based estimates show that trade cost arising from NTMs, often reduces trade volume, with exception of the sanitary and phytosanitary area.[10]

Cadot and Gourdon (2016) and Cadot et al. (2018) address what they see as the limitation of Kee et al (2009) and use unit values (equivalent to price) to directly estimate AVEs, without using import elasticity.[11] However, these two papers have major limitations as Cadot and Guordon (2016) do not give a logical explanation of using a monopolistic competition framework for empirical analysis instead of trade theory. Also, Cadot et al. (2018) use OLS regressions without explaining the theoretical framework.

An important shortcoming of the papers by Kee et al. (2009), Kee and Nicita (2016), and Niu et al. (2018) is that they do not focus on streamlining the regulatory environment, an option available to countries to reduce the impact of NTMs. More recent work by Cadot et al. (2018) estimates the trade effects of NTMs both on trade volume and value captured in AVEs, considering the regulatory distance. One of their important conclusions is that the regulatory differences are the key contributor to NTM-related trade costs.[12] However, they did not mention the streamlining and harmonising regulations.

Other studies discussing the effect of NTMs on trade, without measuring AVEs include Liu et al. (2019. They compare the estimated export values without NTMs, with the real export values after NTMs implementation for agri-food in African countries for years 1996-2013. They conclude the actual export values after the impact of NTMs are less than the estimated values without NTMs, for developing countries. They assume that the difference between actual export values and estimated ones captures the effect of NTM on export volume. They did not estimate the AVEs of NTMs.

There has been limited research done on NTMs and their impact on trade in Pakistan. Kiyani and Shah (2014) report that Pakistan's NTBs have no significant effect on imports. They use data from 2010/2011 and therefore are unable to make a comparison with the pre-2006 situation. Another study by Yeo and Deng, (2019) find that NTBs negatively affect Pakistan's trade with its dominant partners. However, this study uses a subjective assessment of NTBs existing in 2015 ranging from 1 (tolerant) to 7 (strict) and they also ignore the incidence of NTMs prior to 2006.

Some researchers discuss the relevance of NTMs in Pakistan using bilateral trade data. Pasha and Pasha (in an undated paper) discuss the trade restrictions imposed by India on Pakistan and conclude that exports of Pakistan may increase if NTMs were relaxed by India. However, this study is also based on outdated data and compares NTMs in the year 1994 to 2004, while most of the NTMs, as we explain in this paper, evolved in Pakistan after 2013. Qayyum and Hera, (2016) access Pakistan's export to China and evaluate the impact of TBT and conclude that TBT enforcement increases exports of

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[10] Unlike Kee et al. (2009) method of measuring AVEs using import elasticities, Cadot et al. (2018) build on the approaches of Gruber et al. (2016) on volumes, and Cadot, and Gourdon (2016) on prices in two separate sets of equations

[11] Cadot et al. (2018); note that one of the limitations of using trade values in the paper by Kee et al. (2009) is that when import elasticity is unity, trade value will not change with change in restrictiveness. P.6.

[12] The detailed methodology of measuring regulatory distance is given in Cadot et al. (2018) Annex 6; P.29

Pakistan to China. However, this assessment is narrow because they consider only TBT and again do not estimate AVEs of NTMS.[13]

In general, in the literature, the assessment of the impact of NTMs on Pakistan is limited due to two main problems. Firstly, none of the studies estimated AVEs of NTMs. Secondly, some of them are using outdated data sets.

There is another important limitation of the above studies in that none of them looked at the impact of restriction posed by NTMs on services. Major improvement in this respect is provided by the paper by the paper Fontagne, et al. (2016) which calculates the impact of NTMs on services. They do so by comparing the cost of eight key services in 117 countries with the most competitive cost of those services in global markets.[14] In the case of Pakistan, they estimate that the average cost of these eight key services is increased by around 88.3 percent as a result of NTMs compared with 54.5 percent for Vietnam, 72.8 percent for India, and 86.6 percent for Sri Lanka. This introduces an immediate cost on the exporters of goods and services that use these services. In the case of Pakistan, services account for 59.8 percent of Pakistan's overall exports when measured in terms of value-added.[15] In this research, we focus on the tariff equivalent of NTMs of goods only. In a subsequent paper, we will study the protection given by NTMs in the service sector.

3. ESTIMATING AVES OF NTMS (TARIFF EQUIVALENT OF NTMS) AND THEIR RELEVANCE

To obtain the AVEs of NTMs, the quantity impact of NTMs and tariffs on imports is first estimated. As a second step, we transform the quantity impact into price effects, using import demand elasticities. The paper follows the methodology that Niu et al. (2018) adopted from Kee et al. (2009).

3.1. Estimating Impact of Tariffs, NTMs and Other Protective Measures on Imports

The basic equation is based on trade theory and accommodates both tariffs and NTMs in a n-good n-factor general equilibrium model.

$$\ln m_{nc} = \alpha_n + \sum \alpha_{nk} \; C_c^k + \beta_{nc}^{Core} Core_{nc} + \beta_{n,c}^{DS} \ln DS_{nc} + \epsilon_{nc} \ln(1 + t_{nc}) + k_{nc} \quad \dots \quad (1)$$

where;

$m_{n,c}$ is the import value of good n in country c evaluated at exogenous world prices, which are all normalised to unity so that, as discussed in the previous section, imported quantities equal $m_{n,c}$.

α_n is the product line intercept, which captures factors related to product n that do not change across countries;

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[13] The study uses the Tobit model and data set for years 2002-2015.

[14] The eight services sectors are: communication, construction, other business services, trade, insurance, other financial intermediation, other government services and transport. See "Estimated Tariff Equivalents of Services NTMs", Lionel Fontagné, Cristina Mitaritonna & José Signoret; CEPII Working Paper (2016) and Website http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=33 .

[15] See "Pakistan Trade Strategy Development and Modernising Trade in Pakistan: A Policy Reform Handbook" World Bank, September 2019; P 105.

C_c^k are k variables that represent country characteristics

$\alpha_{n,k}$ is the coefficient to measure impact of country-specific characteristics

$Core_{n,c}$ is a dummy variable for each category of core NTMs for product n in country c; it takes value 1 in the presence of the core NTMs otherwise it is 0.[16]

$\beta_{n,c}^{Core}$ is a coefficient which captures the impact of the presence of core NTMs by country c and product n.

$DS_{n,c}$ is the agricultural domestic support (subsidies) provided in dollars

$\beta_{n,c}^{DS}$ is the coefficient which captures the effect for the presence of agriculture support by country c and product n.

$\epsilon_{n,c}$ is the import demand elasticity which is assumed to be constant over time

$t_{n,c}$ is an ad-valorem tariff on good n in country c

$k_{n,c}$ is an error term

Equation (1) represents imports as a function of NTMs, tariffs, subsidies, country characteristics, and an error term. It can be represented in simple functional form as follows:

1. NTMs 2. Agricultural subsidy 3. Tariffs 4. Country Characteristics	⟹ Import Quantity
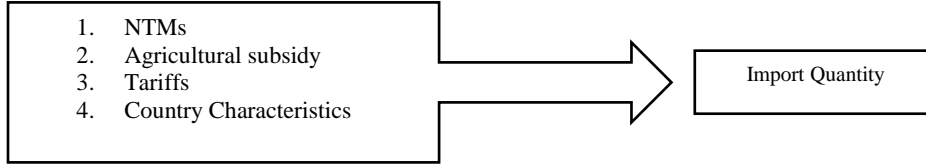
Equation (1) is modified by imposing structures on the coefficients $\beta_{n,c}^{Core}$ and $\beta_{n,c}^{DS}$ by decomposing each one into country-specific factors and product (tariff line) specific factors. This decomposition captures product and country variation and improves econometric estimation. The modified equation, shifting tariff to the left-hand side, takes the following form:

$$\ln m_{nc} - \epsilon_{nc}\ln(1 + t_{nc}) = \alpha_n + \sum_k \alpha_{nkt} C_C^k + \left(\beta_n^{Core} + \sum_k \beta_{nk}^{Core} C_c^k \right) Core_{nc}$$

$$+\left(\beta_n^{DS} + \sum_k \beta_{nk}^{DS} C_c^k \right)\ln DS_{nc} + k_{n,c} \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (2)$$

In Equation (2) β_n^{Core} and β_n^{DS} give the product specific factors and $\beta_{nk}^{Core} C_c^k$ and $\beta_{nk}^{DS} C_c^k$ give country-specific factors. β_{nk}^{Core} estimates the effect of *k*th country-specific endowment on the import volume for product n in country c in the presence of a core NTM category. The co-efficient β_{nk}^{DS} measures the effect of *k*th country-specific endowment on the import volume for product n in country c with 1 percent increase in $\beta_{n,c}^{DS}$ (the coefficient for agriculture support).

An important assumption underlying the model is that theoretically the coefficients β_n^{Core} and β_n^{DS} are expected to be negative. They can be zero if the NTM measure is not restrictive when the tariff is binding, but the unrestricted positive estimates are

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[16] NTMs are divided into core and non-core (see section 4). In this assessment, by convention, we use a limited category of core NTMs namely technical measures, quantity control measures, price measures and monopolistic measures.

economically meaningless. Hence β_n^{Core} and β_n^{DS} are constrained to be non-positive. To apply this restriction in the model, exponential functions are applied to the coefficient for core NTM and domestic support. The modified equation then takes the following non-linear form:

$$\ln m_{nc} - \epsilon_{nc} \ln(1 + t_{nc}) = \alpha_n + \sum_k \alpha_{nk} C_C^k + \left(-e^{(\beta_n^{Core} + \sum_k \beta_{nk}^{Core} C_c^k)}\right) Core_{nc}$$
$$+ \left(-e^{(\beta_n^{DS} + \sum_k \beta_{nk}^{DS} C_c^k)}\right) ln DS_{nc} + k_{nc} \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

Thus, the estimate of the impact of core NTNs and agricultural domestic subsidies on imported volumes (β_n^{Core} and β_n^{DS}) is obtained by estimating (3) using non-linear least squares regression.

3.2. Estimating AVEs of NTMs and Overall Protection

We now need to obtain the tariff equivalents of NTMs, the AVEs of NTMs, to allow comparison with tariffs. This is obtained in a second step using equation (1) to transform the quantity impact of core NTMs into the impact of the core NTMs on domestic prices.

We start by partially differentiating equation 1 with respect to core NTMs, noting that p^d is the domestic price

$$\frac{\partial \ln m_{nc}}{\partial Core_{nc}} = \frac{\partial \ln m_{nc}}{\partial \ln p_{n,c}^d} * \frac{\partial \ln p_{n,c}^d}{\partial Core_{nc}} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

Re-writing Equation (4), noting that $\frac{\partial \ln m_{nc}}{\partial \ln p_{n,c}^d}$ is the elasticity of imports with respect to domestic prices, $\epsilon_{n,c}$, and $\frac{\partial \ln p_{n,c}^d}{\partial Core_{nc}}$ is the tariff equivalent of NTMs, $Ave_{n,c}^{Core}$, measuring the impact of core NTMs on domestic prices.

$$\frac{\partial \ln m_{nc}}{\partial Core_{nc}} = \epsilon_{n,c} * Ave_{n,c}^{Core}$$

Or,

$$Ave_{n,c}^{Core} = \frac{1}{\epsilon_{n,c}} \frac{\partial \ln m_{nc}}{\partial Core_{nc}} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (5)$$

Since the $Core_{n,c}$ is a dummy binary variable, and therefore not subject to differentiation, we obtain $\frac{\partial \ln m_{nc}}{\partial Core_{nc}}$ by taking difference of equation 1 evaluated at $Core_{n,c} = 0$ and at $Core_{n,c} = 1$. This gives the percentage change in imports due to core NTMs (See Annex-III for mathematical proof).

$$\frac{\Delta m_{nc}}{m} = e^{\beta_{nc}^{Core}} - 1 \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (6)$$

Where $\frac{\Delta m_{nc}}{m}$ is approximately equal to $\frac{\partial \ln m_{nc}}{\partial Core_{nc}}$.

Substituting Equation (6) in equation (5), we get the following equation.

$$Ave_{n,c}^{Core} = \frac{e^{\beta_{n,c}^{Core}} - 1}{\epsilon_{n,c}} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (7)$$

Equation (7) gives the instantaneous percentage change in domestic prices due to core NTMs. To estimate AVEs, we need estimates of demand elasticities of imports and $\beta_{n,c}^{Core}$. As noted above, non-linear regression estimates of equation (3) give the estimates of $\beta_{n,c}^{Core}$.

Finally, overall protection T_{nc}, is the sum of tariffs imposed by country c on product n, t_{nc}, and AVEs of NTMs imposed by country c on product n, Ave_{nc}, given as:

$$T_{nc} = t_{nc} + Ave_{nc} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (9)$$

3.3. Estimating Relevance of AVEs Through the Frequency Index and Coverage Ratios

Following Nicita and Gourdon (2013), the frequency index of NTMs imposed by country j is calculated using the following equation:

$$F_{ijk} = \left[\frac{\sum D_{ijk} M_{ij}}{\sum M_{ij}} \right] * 100 \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (10)$$

where F_{ijk} is the frequency index for a group of products, i, in country j for a particular category of the core NTMs, k; M_{ij} is a dummy variable that indicates whether there are imports of those products, i, into country j, and D_{ijk} is a dummy variable reflecting the presence of at least one of the core NTMs in the category being considered, k, for product group, i in country j. *The frequency index (FI) summarises the percentage of the number of imported products, in the group affected by at least one category of core NTMs being considered.* The measured frequency lies between 0 and 1, and the greater the value, the higher frequency of core NTMs; in this paper we represent the frequency index as lying between 0 and 100 percent.

The importance of NTMs on overall imports is measured using the coverage ratio. *The coverage ratio (CR) measures the share of the value of imports subject to at least one category of core NTMs being considered for a country*, with a higher value indicating greater coverage by core NTMs.

The coverage ratio formula, also adopted from Nicita and Gourdon (2013) is given as:

$$C_{ijk} = \left[\frac{\sum D_{ijk} V_{ij}}{\sum V_{ij}} \right] * 100 \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (11)$$

where C_{ijk} is the coverage ratio for a group of products, i, for a particular category of the core NTMs, k, in country j; V_{ij} is the import value of these products i in country j, and D_{ijk} is a dummy variable reflecting the presence or absence of at least one category of the core NTMs in the category being considered, k, for product group, i. in country j.

4. DATA

According to the MAST classification of NTMs, prepared by UNCTAD in 2012, there are 22 main categories of NTMs of which 16 are related to imports.[17] If we include subcategories, there are a total of 150 NTMs. By international convention, we are focusing on core NTMs which fall under four categories: Price control measures

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[17] See Annex IV

(TRAINS M3 code F1-F3), Quantity Restrictions (TRAINS M3 code A1, B1, E1-E3, G33), Technical measures (TRAINS M3 code A, B, C), and Monopolistic measures (TRAINS M3 code H). We use the classification of NTMs developed by UNCTAD under the MAST framework outlined in Annex 1.

We are using the latest data on NTMs from the World Integrated Trade Solution database (WITS) for Pakistan for 96 product groups.[18] The latest NTM data available for Pakistan at detailed 6-digit HS product level covers NTMS introduced from 1967 to 2015. The data for 2016 is available but shows that there has been no change in 2016 and our estimates were carried out for 2015 to allow international comparison and estimates of AVEs of NTMs. It is also to be noted that there is no data available for core NTMs related to monopolistic measures and price controls for Pakistan. Therefore, our estimation is limited to only two core NTMs: technical measures and quantity control measures. The top ten most applied NTMs to imports in Pakistan in 2015 are listed in Table 1. Note that the E322 measure applies to 100 percent of all imports and was introduced in 2013 (Annex VI). The significance of this in estimating FI and CR is discussed later.

Table 1

Top 10 Most Applied Non-tariff Measures on Imports in Pakistan in 2015
Listed According to Frequency Index Measured as a Percentage

	Core NTM type	FI	CR
1	**E322**. Prohibition for political reasons (embargo)	100	100
2	**B7.** Product quality, safety, or performance requirements	24.32	17.20
3	**E316**. Prohibition of used, repaired, or remanufactured goods	13.15	16.19
4	**B31**. Labelling requirements	10.49	12.15
5	**A83**. Certification requirements	9.86	4.81
6	**E129**. Licensing for non-economic reasons not elsewhere specified	7.83	25.41
7	**B33**. Packaging requirements	7.29	6.13
8	**B42**. Technical barriers to trade regulations on transport and storage	6.65	4.59
9	**B32**. Marking requirements	6.52	4.24
10	**C3**. Requirement to pass through specified port of customs	5.50	8.46

Source: Author's calculation using WITS data (Annex V).

Tariff data is taken from the WITS database. The import data for Pakistan is also taken from WITS database. Estimates of AVEs for Pakistan have been extracted from the public database created by Niu et.al. 2018.[19]

5. RESULTS AND DISCUSSION

5.1. Incidence of NTMs

To investigate the evolution and intensity of NTMs, we use the two measures outlined in the previous section. We start with the frequency index which estimates the percentage of the number of imported products in the group affected by at least one category of core NTMs.

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[18]WITS software offers an interface that provide access to UNCTAD Trade Analysis Information System (UNCTAD-TRAIN data) and United Nations Commodity Trade Statistics (COMTRADE) at https://wits.worldbank.org/

[19] The data is available at https://www.nottingham.ac.uk/gep/links/index.aspx

The frequency index of quantity control measures and technical measures was estimated for the years 2003, 2006, and 2015 for 18 product groups is shown in Table 2. No data is available on price control and monopolistic measures for Pakistan. Also, the data shows that no new core NTMs were introduced between 2004 and 2012, and the coverage of existing NTMs in terms of products to which they apply also remained unchanged except for small changes in 2005 and 2006 (see Annex VI and Table 4). Thus, there was no significant change in the frequency index in 2009 and 2012. Table 2 gives unweighted means for agricultural and manufacturing sectors and all sectors.

Table 2

Frequency Index of Types of Core NTM Types across Economic Sectors (Percentages)
(QC is Quantitative Restriction and TM Refers to Technical Measures)

	2003		2006		2015	
Industry name	QC	TM	QC	TM	QC	TM
Agricultural Products (HS0 Industry 1-24)						
Live Animals (1-5)	9.26	74.07	16.22	77.03	81.44	100
Vegetable Products (6-14)	7.19	24.18	5.53	19.60	10.34	94.40
Fats and Oils (15)	0.00	2.70	2.86	5.71	61.76	69.70
Prepared food stuffs (16-24)	9.92	19.01	9.72	20.14	24.85	73.94
Agricultural mean	**6.59**	**29.99**	**8.58**	**30.62**	**44.60**	**84.51**
Manufacturing products (HS0 Ind. 25-97)						
Mineral products (25-27)	1.06	0.00	1.12	0.00	16.51	8.26
Chemical Products (28-38)	36.19	36.88	37.05	37.88	51.30	51.01
Rubber and Plastics (39-40)	0.00	0.00	0.00	0.00	54.37	49.51
Raw hide and skins (41-43)	0.00	0.00	0.00	0.00	0.00	0.60
Wood (44-46)	0.00	0.00	0.00	0.00	0.00	15.58
Paper (47-49)	0.00	0.00	0.00	0.00	13.33	61.48
Textile (50-63)	0.58	0.19	0.30	0.15	0.43	93.56
Footwear (64-67)	0.00	0.00	0.00	0.00	0.00	100
Stone and cement (68-70)	0.00	0.00	0.00	0.00	7.25	78.26
Base metals (71-83)	0.20	0.00	0.19	0.00	19.23	13.92
Machinery and electrical equipment (84-85)	0.00	0.00	0.00	0.26	49.27	6.09
Motor vehicles (86-89)	0.00	0.00	0.00	0.00	74.34	12.39
Optical and medical instruments (90-92)	0.00	0.00	0.00	0.00	34.00	17.00
Miscellaneous goods (93-97)	6.15	0.00	6.47	0.00	13.18	36.43
Manufacturing mean	**3.16**	**2.65**	**3.22**	**2.73**	**23.80**	**38.86**
Mean for all products	**7.55**	**9.20**	**7.36**	**9.31**	**29.96**	**46.85**

Source: Author's calculation based on WITS data.

Four important points can be deduced from Table 2. First, the frequency index increased substantially between 2003 and 2015 indicating both an increasing number of NTMs and their coverage in terms of products to which they apply. The evidence shows that the increase in coverage in terms of products to which the new or existing NTMs apply was much higher than the number of new NTMs introduced in each year (see Table 4 and Annex VI).

The total mean of the frequency index for quantity control measures for all products jumped from 7.6 percent in 2003 to 30 percent in 2015 on an unweighted basis. The equivalent index for technical measures also increased from 9.2 percent in 2003 to 46.9 percent in 2015 on an unweighted basis.

Second, on average, more agriculture products are subject to at least one NTM as compared to manufacturing products. Looking at Figure 5, which gives the estimated frequency index in 2015 combining both Quantity Control and Technical Measures, on

average 85.7 percent of agriculture products are subject to at least one core NTM as compared to 56.4 percent in the manufacturing sector. Within the manufacturing sector, the footwear sector has the highest frequency index of 100 percent while the textiles sector is exposed to the second-highest level of NTM measures at 93.7 percent. In the agriculture sector, live animals have the highest frequency index of 100 percent.

The third point is that the technical measures were the most widely applied NTMs across the sectors in Pakistan. The average frequency index for all products (HS code 1-96) of technical measures is greater than that of quantity control measures in 2003, 2006, and 2015.

Finally, the frequency index for both quantity control and technical measures is about the same in 2003 and 2006 before increasing substantially in 2015. One major explanation is that that the WITS database shows that no new NTMs were introduced between 2004 and 2012 and almost half of all NTMs (17 out of 42) were introduced between 2013 and 2015. At the same time, the increase in coverage in terms of products to which they apply in 2013-2015 accounts for about two-thirds of those in the entire period from 1967 to 2015 (12,534 out of 18,206). [20]

An important technical point is worth noting in estimating the frequency index and coverage ratio. For 2015, estimates for FI and CR exclude the E322 NTM as they apply to 100 percent of products - as noted in the data section this NTM was first introduced by Pakistan in 2013 as can be seen in Annex VI. This approach is consistent with the approach used by UNCTAD. If we include E322 then all estimates for the frequency index and coverage ratio in 2015 would be 100 percent.

Fig. 5. Frequency Index of All Core NTMs Applied to Agriculture and Manufacturing Sector in 2015

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[20]See Table 4 and Annex VI.

Manufacturing sector (2015)
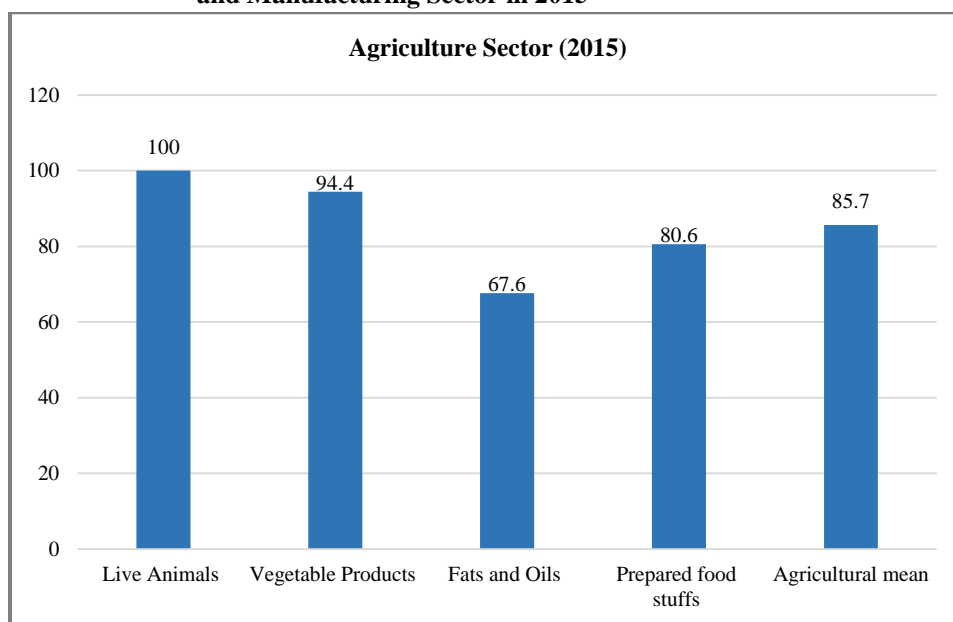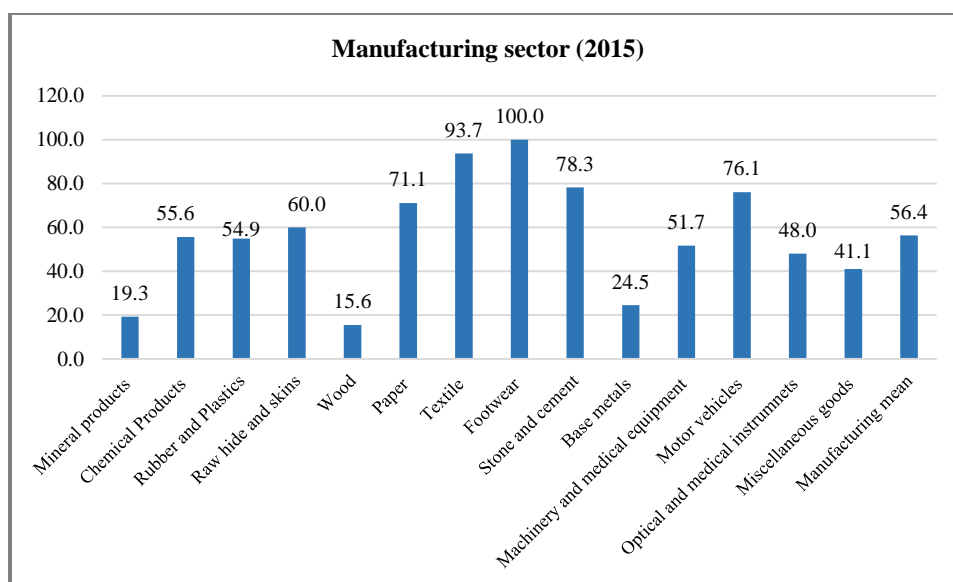
Source: Author's calculation based on WITS data.

Figure 6 provides a comparison of the incidence of different types of core NTMS over time using both the frequency index and the coverage ratio. It shows clearly again that the incidence of different types of NTMs increased substantially between 2003 and 2015 but remained relatively unchanged between 2003 and 2006. The coverage ratio which measures the share of imports covered by different types of NTMs is about the same level as the frequency index. It tends to be higher than the frequency index if the value of imports of the products with the NTMs being considered is higher and vice versa.

Fig. 6. Incidence of Different Types of Core NTMs Overtime for Pakistan Using Frequency Index and Coverage Ratio

Source: Author's calculation using WITS data.

16
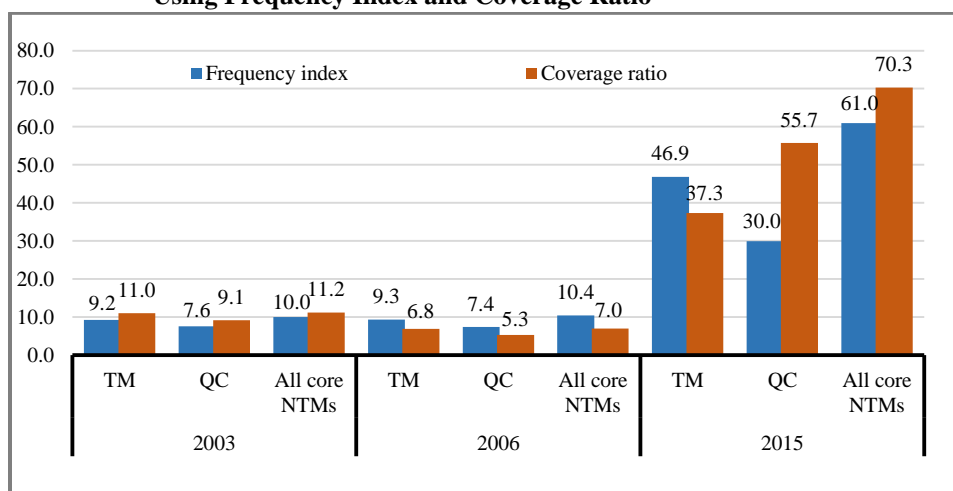
5.2. AVEs of NTMs (the Tariff Equivalent of NTMs)

Table 3 summarises the estimates of AVEs (tariff equivalent of NTMs) and their distribution across the sectors for the years 2003, 2006, and 2015. As can be seen the average protection by NTMs as represented by AVEs in total jumped from about 1 percent in 2003 to 55 percent in 2015. This can also be seen clearly from Figure 7. If we compare agriculture with manufacturing sectors in Table 3, both were equally protected at about 1 percent in 2003 and this remained true in 2015: the protection provided by NTMs in the manufacturing sector (55.8 percent) is of the same order although a little higher than in the agriculture sector (45.2 percent). We arrive at a similar conclusion by comparing 2006 and 2015: NTM protection increased substantially in both sectors when we look at the average AVEs of NTMs in the two sectors and the overall mean.

Table 3

Average AVEs of NTMs (Expressed in Percentages) for Product Groups for Pakistan

Industry Code	Industry name	2003	2006	2015
1-5	Live animals; animal products	0.01	0.13	51.54
6-14	Vegetable products	0.08	0.10	64.21
15	Fats and oils	10.71	18.08	49.25
16-24	Prepared foodstuffs	0.54	0.39	21.78
Agricultural mean (1-24)		**1.43**	**2.20**	**45.21**
25-27	Mineral products	0.04	0.00	34.77
28-38	Chemical products	5.03	1.86	46.61
39-40	Rubber and plastics	0.02	0.00	71.95
41-43	Raw hide and skins	0.00	0.00	20.65
44-46	Wood	0.00	0.00	6.41
47-49	Paper	0.02	0.53	43.83
50-63	Textile	0.00	0.14	41.73
64-67	Footwear	0.00	0.00	23.15
68-70	Stone and cement	0.32	0.10	41.20
71-83	Base metals	0.16	0.00	55.85
84-85	Machinery and electrical equipment	0.00	0.19	73.50
86-89	Motor vehicles	0.45	0.03	27.47
90-92	Optical and medical instruments	0.00	0.00	102.76
93-96	Miscellaneous goods	0.00	0.00	59.67
Manufacturing Mean (25-96)		**1.03**	**0.44**	**55.80**
Total Mean – All Products (1-96)		**1.06**	**0.58**	**55.18**

Source: Author's estimation using data from Niu et al. (2018)

Note: The estimated mean for agriculture sector is the average of AVEs of all products in groups 1 to 24. This is not equal to the mean of the four product groups in the agriculture sector as they have different number of products in each group. Same is the case for manufacturing AVEs and for the Total Mean.

Within the agricultural sector, the sectoral distribution of AVEs of NTMs indicates that fats and oils were the most protected product groups in 2003 and 2006 (10.7 percent), while in 2015 there is a substantial increase in AVEs across the board with vegetable products having the highest protection by NTMs (64.2 percent) as measured by AVEs and with live animals, the second highest at 51.5 percent.

Within the manufacturing sector, the sectoral distribution of AVEs of NTMs indicates that chemical products had the highest AVEs in 2003 at 5 percent. The picture changed substantially in 2015. AVEs increased across the board with the highest protection afforded to optical and medical instruments of 102 percent, with machinery and electrical equipment in second place with AVEs of 73 percent and rubber and plastics third at 72 percent. The textile sector, which contributes the most to Pakistan's exports also had a high AVE of 41 percent, representing substantially increased protection compared with 2003 when the AVE was zero.

Fig. 7. Average AVEs of NTMs for Product Groups in Pakistan for 2003 and 2015
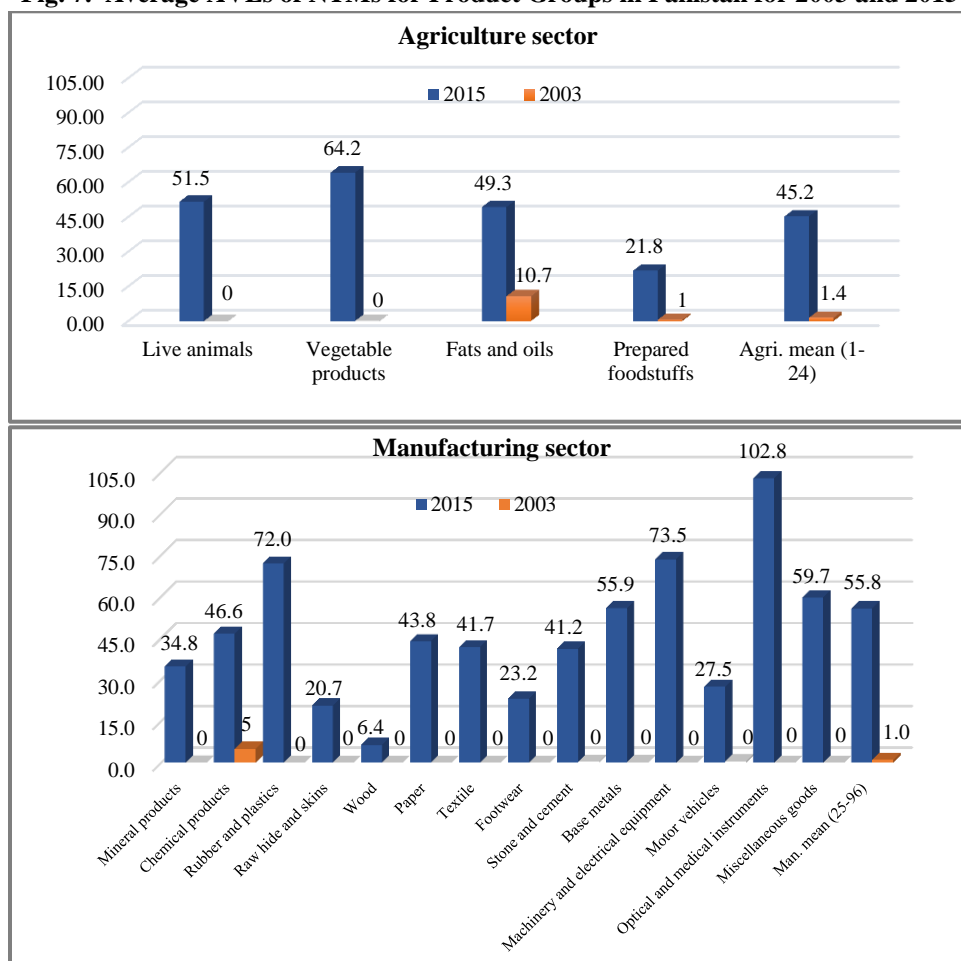
Source: Author's estimation using data from Niu et al. (2018).

If we consider the NTMs data for Pakistan in Table 4, again we get a better understanding of why the AVEs increased so substantially between 2003 and 2015. First, there were no new NTMs introduced in the period 2004 to 2012, and subsequently, a substantial number, 17, were introduced in 2013 and 2014 representing a little less than half of the total of 42 NTMs covering imports in Pakistan introduced from 1967 to 2015.

Table 4

Number of New (Core) NTMs and Coverage in Pakistan (1967-2015) *

Year	Number of New (Core) NTMs	Coverage
1967	17	1875
1973	4	36
1976	1	46
1979	1	23
1980	0	1680
1986	0	150
1991	0	41
1997	1	134
2003	1	1680
2005	0	2
2006	0	5
2013	**16**	**10953**
2014	1	1144
2015	0	437
Total	**42**	**18206**

Source: Author's calculation based on WITS data

*Coverage represents new products subject to existing or new core NTMs introduced that year.

Second, the number of NTMs introduced each year is dominated by the coverage in terms of products affected by NTMs with, as noted above, two-thirds of the products affected by these NTMS introduced after 2013.

Third, there is a possibility that the regulatory process was intensified with the increase in coverage and led to a higher impact on domestic prices. This is also likely, especially given that 100 percent of imports were subject to at least one NTM (E322) and thus examination by customs compared with 11.2 percent in 2003. However, we do not have any data on the regulatory process.

Table 5 outlines the relative increase in AVEs between 2003 and 2015 in the case of Pakistan and comparator countries for which estimates of AVEs are available from Niu et al (2018). As can be seen, the relative increase in the AVEs for imported goods between 2003 and 2015 in Pakistan dwarfs the increase in India, Sri Lanka, and Vietnam. On average for all sectors, in Pakistan, the estimated AVEs in 2015 were 52 times higher than in 2003 compared to 6 times in India and 1.53 times in Vietnam and declined by 2 percent in Sri Lanka. In the case of manufacturing, AVEs in Pakistan were over 54 times the level in 2003 during this period compared with 8.6 times in India, 1.7 times in Vietnam, and unchanged in Sri Lanka.

Despite this increase or catch-up, AVEs in Pakistan were still lower than in the other three countries by 2015, representing a potential for further increases post-2015. However, if AVEs in Pakistan were by 2015 lower than comparator countries, it still raises the question as to why Pakistan's exports were stagnating while those in comparator countries with higher protection, as measured by AVEs, flourishing?

One possible answer may lie in the large impact of the NTMs on services on the costs facing exporters. As noted above, in the case of Pakistan, services account for 59.8 percent of Pakistan's overall cost of exports, and the average cost of key services is estimated to have increased by around 88.3 percent because of NTMs. This compares with 54.5 percent for Vietnam, 72.8 percent for India, and 86.6 percent for Sri Lanka. [21]

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[21] These estimates were for 2011 and we hope to update them in a future paper.

Table 5

AVEs of NTMs between 2003 and 2015 in Comparator Countries

Country	Sectors	2003	2006	2015	2015 as ratio of 2003*
India	Agriculture (1-24)	0.4508	0.3686	0.6807	1.51
	Manufactg. (25-96)	0.0872	0.1006	0.7458	8.55
	All Sectors (1-96)	0.1185	0.1225	0.7412	6.25
Sri Lanka	Agriculture (1-24)	0.8086	0.6527	0.5304	0.66
	Manufactg. (25-96)	0.7489	0.4526	0.7558	1.01
	All Sectors (1-96)	0.7544	0.4696	0.7405	0.98
Pakistan	Agriculture (1-24)	0.0143	0.0220	0.4521	31.62
	Manufactg. (25-96)	0.0103	0.0044	0.5580	54.17
	All Sectors (1-96)	0.0106	0.0058	0.5518	52.06
Vietnam*	Agriculture (1-24)	-	0.7195	0.6260	0.87
	Manufactg. (25-96)	-	0.4868	0.8022	1.65
	All Sectors (1-96)	-	0.5126	0.7849	1.53

Source: Author's calculation using data from Niu et.al (2018).

   *For Vietnam we are using 2006 as base year instead of 2003.

5.3. Overall Protection

To measure overall protection, using Equation (5), we combine the data on tariffs and AVEs of NTMs. Table 6 summarises the average estimated AVEs of NTMs, average tariffs, and overall protection for the years 2003, 2006, and 2015. The evolution of NTMs increased significantly from 2013 to 2015 and NTMs evolved as a dominant source of protection as compared to the tariff for Pakistan at a time when average tariffs were declining. In 2003 average AVEs are lower than average tariffs, but the opposite is true in 2015.

Table 6

Average AVE Estimates, Tariffs, and Overall Protection (in Percentages)

	Simple Average			Import-weighted average			
Years	AVEs	Tariffs	Overall	AVEs	Tariff	Overall	Imports (US $bn) Billion
2003	1.06	16.98	18.04	1.44	16.71	18.15	13.0
2006	0.58	14.86	15.44	0.79	12.71	13.50	29.8
2015	55.18	12.73	67.91	50.83	9.58	60.41	43.9

Source: Author's calculation using import data and tariff data from WITS.

Average tariffs have been declining only slightly over the years while the AVEs have increased several-fold in the same period. The unweighted average tariff rate fell from 17 percent in 2003 to 13 percent in 2015 but the level of overall protection has been increasing. The average AVEs of NTMs increased from 1 percent in 2003 to 55 percent in 2015 and 51 percent in import weighted terms. The tremendous surge in NTMs and their coverage contributed to the increase in overall protection from 18 percent in 2003 to 68 percent in 2015. NTMs have evolved as a more important source of protection than tariffs over the years.

Thus, tariffs were contributing more to overall protection in 2003 and 2006, while the opposite was in 2015. Trade liberalisation policies addressing tariffs may not help in boosting exports in Pakistan, NTMs need to be addressed. The overall level of protection is extremely high. It is underestimated by looking only at declining tariffs which do not measure overall protection.

5.4. Impact of NTMs on Domestic Prices and Policy Options—NTM Simplification

The paper confirms the price raising effect of NTMs in Pakistan. Our analysis suggests that NTMs raise the domestic price of affected products, on average, by a large 55 percent. The streamlining of non-tariff measures provides the best entry door to that process by reassessing their necessity and coverage, and by streamlining the regulatory process and harmonising it with trading partners. This will help not only to enhance export competitiveness but also reduce the impact on domestic prices and, with it, help ease inflationary pressures, a major concern of policymakers.

Streamlining NTMs should not be thought of as a search for quick wins to reduce trade costs by a few percentage points, but more ambitiously in the context of a wide-ranging regulatory-improvement agenda.

Consistent with Cadot's recommendations for Morocco, the streamlining of NTMs in Pakistan can be achieved by taking two crucial actions. [22]

(a) A comprehensive review of existing NTM measures to eliminate the inefficient NTMs on basis of cost-benefit analysis.

(b) Build an effective regulatory and governance structure for the new and updated NTMs.

The government should work in collaboration with the private sector to conduct such reviews to gain efficiency and transparency in the system. This will reduce trade costs arising from NTMs and will open doors to improving ease of doing business. Ideally, the streamlining of NTMs should be based on "regulatory impact assessment" (RIA).

The government of Pakistan should devise policies for easing and simplification of NTMs. The benefit of doing so is well articulated by a recent World Bank blog post which emphasises the challenges faced by developing countries in terms of trade costs stemming from compliance with NTMs and they report that developed countries are better able to manage NTM simplification. [23]

> *"Beyond tariffs, many goods that go through customs face myriad inspections and certifications to confirm they satisfy various safety requirements, health standards and technical regulations…. Complying with NTMs is costly and time-consuming for both importing and exporting firms. Tariff reductions and NTM simplification are not likely to impose high costs on high and upper-middle income countries, which account for over 90 percent of world trade.* (Kee, et al. 2020)".

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[22]See chapter on Trade Competitiveness (by Oliver Cadot) in Country Economic Memorandum of the IDB Group for Morocco (2012) Edited by Irfan Aleem.

[23]https://blogs.worldbank.org/developmenttalk/free-trade-now-case-tariff-reductions-and-non-tariff-measures-simplifications-fight

6. CONCLUSIONS

The results in this research paper help to provide an alternative and convincing explanation for the reasons why Pakistan's exports have stagnated since around 2012 after growing significantly during the previous decade. While many other factors have undoubtedly contributed, as discussed in the introduction, the evidence outlined in this paper indicates that the substantial increase in overall protection driven by the incidence of non-tariff measures has had a major and decisive impact. Policymakers need to refocus their attention to the increase in overall protection caused by NTMs rather than tariffs.

To enhance the competitiveness of Pakistan's exports, reducing tariffs, which are among the highest in the world, will undoubtedly help, but what this paper is presenting is the urgent need to manage and reduce the impact of NTMs, which dominate overall protection, by reassessing their necessity and coverage, and by streamlining and harmonising the regulatory process with trading partners. This will also help to reduce the impact on domestic prices and, with it, help in easing inflation, a major concern of policymakers.

This paper investigates the evolution and intensity of NTMs in the good sector at specific points in time over the period 2003-2015 for Pakistan and their impact on domestic prices. Our results show that the increasing proportion of products were subject to quantity control measures and technical measures in Pakistan from 2003 to 2015. Technical measures are the most widely applied NTMs across the sectors. The agricultural sector has a higher frequency index than the manufacturing sector; on average 85.7 percent of agriculture products are subject to at least one core NTM as compared to 56.4 percent in the manufacturing sector as of 2015.

The protection provided by NTMs as measured by AVEs significantly increased from 1 percent in 2003 to 55 percent in 2015. Within the agricultural sector, the sectoral distribution of AVEs of NTMs indicates that fats and oils were the most protected product groups in 2003 and 2006 (10.7 percent), while in 2015 there is a substantial increase in AVEs across the board with vegetable products having the highest protection by NTMs (64.2 percent) as measured by AVEs and with live animals, the second highest at 51.5 percent.

Within the manufacturing sector, the sectoral distribution of AVEs of NTMs indicates that chemical products had the highest AVEs in 2003 at 5.3 percent. The picture changed dramatically in 2015. AVEs increased across the board with the highest protection afforded to optical and medical instruments of 102 percent, with machinery and electrical equipment in second place with AVEs of 73 percent and rubber and plastics third at 72 percent. The textile sector, which contributes the most to Pakistan's exports also had a high AVE of 41 percent, representing substantially increased protection compared with 2003 when the AVE was zero.

The increased incidence of NTMs has been driving overall protection in comparison to tariffs since 2003. While average tariffs have been declining since 2003, there has been an increase in overall protection driven by NTMs. Overall protection increased from 18 percent in 2003 to 68 percent in 2015. Hence. we conclude that NTMs, a large number of which were introduced between 2013 and 2015 have evolved into a more important source of protection compared to tariffs over the years since 2003.

Our results are consistent with Niu et al (2018) that the increase in overall protection is currently dominated by NTMs and not by tariffs. A limitation of our study is that we have not considered the impact of NTMs on services, a priority for future research given services account for 59.8 percent of Pakistan's overall exports when measured in terms of value-added.

ANNEX-I

The MAST (Multi-agency Support Team) Classification System 2012 for Non-tariff Measures

	Technical Measures	A	Sanitary and phytosanitary measures (SPS)
		B	Technical barriers to trade (TBT)
		C	Pre-shipment inspection and other formalities
		D	Price control measures
		E	Licenses, quotas, prohibition and other quantity control measures Nontechnical measures
		F	Charges, taxes and other para-tariff measures
Imports	Non Technical Measures	G	Finance measures
		H	Anti-competitive measures
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies (excluding export subsidies)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin Export measures
Exports		P	Export-related measures (including export subsidies)

Source: UNCTAD (2016).

Explanation: "Measures are divided into two broad categories: import measures and export measures. All chapters from A to O reflect the requirements of the importing country on its imports. Only chapter P comprises export measures, which refer to requirements imposed by the exporting country on its own exports. Import measures can be executed or verified in either the exporting or the importing country, but always relate to a condition for the importation of the product.

Import measures are further subdivided into technical measures and non-technical measures.

The first group is comprised of three chapters (A to C): SPS, TBT, and pre-shipment inspection and other formalities. Non-technical measures are subdivided into twelve chapters (D to O). Export measures comprise only one chapter (P). Currently, measures falling within chapters J through O are not collected. So, the data are available on Chapters from A to I, and Chapter P.

Note: Difference between regulations and measures: A regulation is a legal document issued officially by a Government, such as a law, decree, or directive. An official regulation could bear several measures (or NTMs). In the classification, a measure is a mandatory trade control requirement enacted by an official regulation. Each regulation must be read to distinguish all measures within its text. All identified measures should be registered separately. In the database of Non-Tariff Measures, both regulations and measures must be recorded and fully to reflect the information embedded within the legal document which is relevant to the trade requirements.

(UNCTAD; 2016, Guidelines to collect data on official nontariff measures)."

Box 2. Brief Description of NTM Chapters

Chapter A, on SPS measures, refers to measures affecting areas such as restriction of substances, and measures for preventing dissemination of disease. Chapter A also includes all conformity assessment measures related to food safety, such as certification, testing and inspection, and quarantine.

Chapter B, on technical measures, refers to measures such as labelling, other measures protecting the

environment, standards on technical specifications, and quality requirements.

Chapter C classifies the measures related to pre-shipment inspections and other customs formalities.

Chapter D, price-control measures, includes measures that are intended to change the prices of imports, such as minimum prices, reference prices, anti-dumping or countervailing duties.

Chapter E, licensing, quotas and other quantity control measures, groups the measures that have the intention to limit the quantity traded, such as quotas. Chapter E also covers licences and import prohibitions that are not SPS or TBT related.

Chapter F, on charges, taxes and other para-tariff measures, refers to taxes other than custom tariffs. Chapter F also groups additional charges such as stamp taxes, licence fees, statistical taxes, and also decreed customs valuation.

Chapter G, on finance measures, refers to measures restricting the payments of imports, for example when the access and cost of foreign exchange is regulated. The chapter also includes measures imposing restrictions on the terms of payment.

Chapter H, on anticompetitive measures, refers mainly to monopolistic measures, such as state trading, sole importing agencies, or compulsory national insurance or transport.

Chapter I, on trade-related investment measures, groups the measures that restrict investment by requiring local content or requesting that investment should be related to export in order to balance imports.

Chapter J, on distribution restrictions, refers to restrictive measures related to the internal distribution of imported products.

Chapter K, on the restriction on post-sales services, refers to difficulties in allowing technical staff to enter the importing country to provide accessory services (for example, the repair or maintenance of imported technological goods).

Chapter L, contains measures that relate to the subsidies that affect trade.

Chapter M, on government procurement restriction measures, refers to the restrictions bidders may find when trying to sell their products to a foreign government.

Chapter N, on intellectual property measures, refers to problems arising from intellectual property rights.

Chapter O, on rules of origin, groups the measures that restrict the origins of products, or their inputs.

Chapter P, on export measures, groups the measures a country applies to its exports. It includes export taxes, quotas or prohibitions, and the like.

Source: (UNCTAD; 2016, Guidelines to collect data on official nontariff measures).

Annex-II

Interpreting AVEs of NTMs

"The ad valorem equivalent (AVE) of an NTM is the proportional rise in the domestic price of the goods to which it is applied, relative to a counterfactual where it is not applied. It is often interpreted as measuring the distortion imposed by the NTM to the domestic economy. While this would be true in an economy characterised by pure and perfect competition and the absence of externalities or public goods, it is not true in more general – and realistic – settings.

While the term "non-tariff measures" suggests a simple parallel with tariffs, NTMs take many forms and fulfil in reality a broad range of objectives, trade and non-trade. In order to disentangle these different forms and objectives and how they map into one another, at the broadest level, two different types are usually distinguished. The first type of measures, called "non-technical", includes quantitative restrictions (QRs), price measures, forced logistics or distribution channels, and so on. The second type of measures, called "technical", includes primarily sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) measures.

Technical measures are generally imposed to address market failures such as information asymmetries or negative externalities. For instance, the distribution of counterfeit drugs has a large negative impact on public health. Inspection and testing requirements on imported drugs are NTMs, and depending on how heavy the requirements are, they can have high AVEs on all drugs, including legal ones. Similarly, two-wheelers with two-stroke engines generate toxic smoke with adverse health effects in urban areas.

Restrictions on the importation of such products are NTMs; they can be considered, de facto, as trade restrictions when the products are not produced locally. However, the measures can be justified as correcting negative externalities, and simply interpreting AVEs as measuring distortions would be severely misleading.

Even if externalities are left aside, interpreting the AVE of a technical measure as a pure trade cost, a tradition that goes back to the work of Otsuki, Wilson and Sewadeh (2001), can be misleading. First, NTMs can alter fixed costs and can thus have different effects on small compared to large firms. For example, a non-discriminatory regulation that induces the exit of small firms, domestic and foreign alike, will alter the market structure. The induced change in market structure may leave non-exiting large firms with more market power than before, and this may apply to foreign as well as domestic firms (Asprilla et al., 2016). In that case, a rise in trade unit values may compound the effects of increased market concentration with NTM compliance costs.

Moreover, an alternative strand of work suggests that NTMs related to standards can work as market-creating "catalysts" in situations of asymmetric information (see e.g. Henson and Jaffee, 2007; Maertens and Swinnen, 2007; Xiong and Beghin, 2014). When the quality of suppliers is heterogeneous and unknown to buyers, regulations can overcome the information deficit and convey a signal that all producers conform to a certain standard, encouraging demand.2 Good regulations can facilitate trade. In such cases, NTMs affect both the product supply curve through the various costs associated with compliance and the demand curve through signaling or "catalyst" effects. (Cadot et al. (2018))."

ANNEX-III

Derivation of equation (4) from Equation (1) to estimate AVEs

$$\ln m_{nc} - \epsilon_{n,c} \ln(1 + t_{nc}) = \alpha_n + \sum \alpha_{nk} \; C_c^k + \; \beta_{nc}^{Core} Core_{nc}$$
$$+ \; \beta_{n,c}^{DS} \ln DS_{nc} + k_{nc} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

$$\ln m_{nc} \mid_{Core=1} - \epsilon_{n,c} \ln(1 + t_{nc}) = \alpha_n + \sum \alpha_{nk} \; C_c^k + \; \beta_{nc}^{Core}$$
$$+ \; \beta_{n,c}^{DS} \ln DS_{nc} + k_{nc} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

$$\ln m_{nc} \mid_{Core=0} - \epsilon_{n,c} \ln(1 + t_{nc}) = \alpha_n + \sum \alpha_{nk} \; C_c^k + \beta_{n,c}^{DS} \ln DS_{nc} + k_{nc} \ldots \qquad (3)$$

difference of Equation 2 and Equation 3 gives:

$$\ln m_{nc} \mid_{Core=1} - \; \ln m_{nc} \mid_{Core=0} = \; \beta_{nc}^{Core}$$

Given that difference in log equals to log of the ratio:

$$\frac{\ln m_{nc} \mid_{Core=1}}{\ln m_{nc} \mid_{Core=0}} = \beta_{nc}^{Core}$$

Taking exponents on both sides gives:

$$\frac{m_{nc}\,|_{Core=1}}{m_{nc}\,|_{Core=0}} \;=\; e^{\,\beta_{nc}^{Core}}$$

Subtracting 1 from both sides gives:

$$\frac{m_{nc}\,|_{Core=1}}{m_{nc}\,|_{Core=0}} - 1 = e^{\,\beta_{nc}^{Core}} - 1$$

$$\frac{\Delta\,m_{nc}}{m} \simeq e^{\,\beta_{nc}^{Core}} - 1 \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

Equation (4) states that the coefficient of core NTMs minus 1 gives the percentage change in imports due to core NTMs.

This implies that the exponential of the coefficient on Core NTBs, β_{nc}^{Core}, minus 1 will give us the instantaneous percentage change in imports due to Core NTBs.

Note that the above mathematical proof is not provided in Kee et al. (2009) and Niu et al. (2018).

ANNEX-IV

<table>
<tr><td align="center">Box 1.</td></tr>
<tr><td align="center">Categories of NTMS by UNCTAD-MAST classification and available at WITS</td></tr>
</table>

A - Sanitary and phytosanitary measures
1)   A1 - Prohibitions/restrictions of imports for SPS reasons
2)   A3 - Labelling, marking and packaging requirements
3)   A8 - Conformity assessment related to SPS
B - Technical barriers to trade
4)   B1 - Import authorisation/licensing related to TBT
5)   B3 - Labelling, marking and packaging requirements
6)   B4 - Production or post-production requirements
7)   B8 - Conformity assessment related to TBT
C - Pre-shipment inspection and other formalities
8)   C3 - Requirement to pass through specified port of customs
E - Non-automatic import licensing, quotas, prohibitions, quantity-control measures and other restrictions other than SPS or TBT measures
9)   E1 - Non-automatic import-licensing procedures other than authorisations covered under SPS and TBT chapters
10)   E2 - Quotas
11)   E21 - Permanent
12)   E3 - Prohibitions
13)   E31 - Prohibition for economic reasons
14)   E32 - Prohibition for non-economic reasons
F - Price control measures including additional taxes and charges
15)   F8 - Decreed customs valuations
J - Distribution restrictions
16)   J2 - Restrictions on distribution channels
P - Export related measures
17)   P1 - SPS and TBT related export measures
18)   P16 - Conformity Assessment
19)   P162 - Inspection requirement
20)   P3 - Export-license, -quota, -prohibition and other restrictions other than SPS or TBT measures
21)   P31 - Export prohibition
22)   P33 - Licensing, permit or registration requirements to export.

Source: WITS.

ANNEX-V

Core Non-Tariff Measures Introduced in Pakistan and Coverage by Products (2015)

NTM- Description	NTM Code	Core NTM Coverage
Prohibitions for sanitary and phytosanitary reasons	A11	1,378
Geographical restrictions on eligibility	A12	12
Authorisation requirement for sanitary and phytosanitary reasons for importing certain products	A14	443
Prohibitions or restrictions of imports for sanitary and phytosanitary reasons, not elsewhere specified	A19	7
Labelling requirements	A31	540
Packaging requirements	A33	1
Microbiological criteria of the final product	A41	1
Hygienic requirements not elsewhere specified	A49	1
Cold or heat treatment	A51	2
Fumigation	A53	209
Storage and transport conditions	A64	1
Testing requirements	A82	358
Certification requirements	A83	2,102
Inspection requirements	A84	471
Origin of materials and parts	A851	41
Distribution and location of products after delivery	A853	41
Quarantine requirements	A86	684
Tolerance limits for residues of or contamination by certain substances	B21	2
Labelling requirements	B31	621
Marking requirements	B32	336
Packaging requirements	B33	417
Technical barriers to trade regulations on transport and storage	B42	342
Product quality, safety or performance requirements	B7	1,185
Product registration/approval requirements	B81	111
Certification requirements	B83	221
Inspection requirements	B84	48
Pre-shipment inspection	C1	19
Requirement to pass through specified port of customs	C3	368
Other formalities not elsewhere specified	C9	520
Non-automatic import-licensing procedures other than authorisations covered under A11 and technical barriers to trade	E1	254
Licensing for non-economic reasons	E12	8
Licensing for religious, moral or cultural reasons	E121	23
Licensing for non-economic reasons not elsewhere specified	E129	478
Quotas Permanent	E21	9
Full prohibition (import ban)	E311	28
Prohibition of used, repaired or remanufactured goods	E316	590
Prohibition for economic reasons not elsewhere specified	E319	6
Prohibition for non-economic reasons	E32	214
Prohibition for religious, moral or cultural reasons	E321	65
Prohibition for political reasons (embargo)	E322	5,992
Prohibition for non-economic reasons not elsewhere specified	E329	54
Authorisation linked with non-official foreign exchange	G33	3
Total	-	18,206

Source: Author's calculation based on data from World Integrated Trade Solution (WITS).

ANNEX-VI

Core NTMs introduced each year and the coverage in terms of new products subjects to existing and new core NTM

NTMCode	1967	1973	1976	1979	1980	1986	1991	1997	2003	2005	2006	2013	2014	2015	Total
A11	42	0	0	0	0	0	0	0	0	0	0	1,120	216	0	1,378
A12	0	0	0	0	0	0	0	0	0	0	0	12	0	0	12
A14	436	0	1	0	0	0	0	0	0	1	0	5	0	0	443
A19	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
A31	0	0	0	0	0	0	0	0	0	0	0	540	0	0	540
A33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
A41	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
A49	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
A51	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
A53	209	0	0	0	0	0	0	0	0	0	0	0	0	0	209
A64	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
A82	0	0	22	0	336	0	0	0	0	0	0	0	0	0	358
A83	353	0	22	0	336	0	0	0	0	0	0	503	888	0	2,102
A84	135	0	0	0	336	0	0	0	0	0	0	0	0	0	471
A851	41	0	0	0	0	0	0	0	0	0	0	0	0	0	41
A853	41	0	0	0	0	0	0	0	0	0	0	0	0	0	41
A86	208	0	1	0	336	0	0	0	0	0	0	28	0	111	684
B21	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
B31	41	6	0	0	0	75	41	0	336	0	0	122	0	0	621
B32	0	0	0	0	0	0	0	0	336	0	0	0	0	0	336
B33	0	6	0	0	0	75	0	0	336	0	0	0	0	0	417
B42	0	6	0	0	0	0	0	0	336	0	0	0	0	0	342
B7	0	0	0	0	0	0	0	0	0	0	0	1,079	0	106	1,185
B81	0	6	0	0	0	0	0	0	0	0	0	105	0	0	111
B83	0	0	0	0	0	0	0	0	0	0	5	101	9	106	221
B84	0	0	0	0	0	0	0	0	0	0	0	48	0	0	48
C1	0	6	0	0	0	0	0	0	0	0	0	0	9	4	19
C3	177	0	0	0	0	0	0	0	0	0	0	191	0	0	368
C9	136	0	0	0	336	0	0	0	0	0	0	48	0	0	520
E1	0	6	0	0	0	0	0	0	0	0	0	129	9	110	254
E12	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8
E121	0	0	0	23	0	0	0	0	0	0	0	0	0	0	23
E129	0	0	0	0	0	0	0	134	336	1	0	7	0	0	478
E21	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9
E311	0	0	0	0	0	0	0	0	0	0	0	28	0	0	28
E316	0	0	0	0	0	0	0	0	0	0	0	590	0	0	590
E319	0	0	0	0	0	0	0	0	0	0	0	2	4	0	6
E32	0	0	0	0	0	0	0	0	0	0	0	214	0	0	214
E321	0	0	0	0	0	0	0	0	0	0	0	65	0	0	65
E322	0	0	0	0	0	0	0	0	0	0	0	5,992	0	0	5,992
E329	44	0	0	0	0	0	0	0	0	0	0	10	0	0	54
G33	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Total	1,875	36	46	23	1,680	150	41	134	1,680	2	5	10,953	1,144	437	18,206

Source: Author's calculation based on data from World Integrated Trade Solution (WITS).

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