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SUBSTITUTION OF TRADE POLICY INSTRUMENTS: THE CASE OF SERBIA

Abstract: In this study, I examine the potential substitutive relationship between tariffs and non-tariff measures, considering the conditions under which such substitution is expected to occur. I develop a deterministic model based on the protection for sale framework, analyzing weighted welfare maximization in a small importing economy. The model derives theoretical conditions for substitution of tariffs with non-tariff measures, highlighting the roles of relative marginal compliance costs between domestic and foreign producers, product price elasticity, consumers' sensitivity to quality, policymakers' prioritization of lobbying, and the existence of binding minimal production standards. Notably, the model predicts the lack of substitution effects when minimum standards are binding and compliance costs are comparable, as often expected in sectors with established and well-justified international standards. These predictions are tested empirically using the sample of non-tariff measure usage in Serbia from 2010 to 2021 across HS-2 sectors. The empirical testing was based on estimating a static model using a within regression estimator and a dynamic model of non-tariff measure usage employing the system-generalized method of moments. The empirical results provide significant and robust evidence of substitution between tariffs and technical measures. The identified substitution effects are also found to be scaled by the institutionalization of lobbying, further supporting the underlying theoretical framework. Conversely, only tentative and non-robust evidence of complementarity between tariffs and sanitary and phytosanitary measures was identified. This divergence likely reflects sectoral differences related to standards heterogeneity and domestic competitiveness.

Keywords: trade policy, non-tariff measures (NTM), tariffs, international trade, lobbying, policy mix, substitution, Serbia

1. INTRODUCTION

The importance of trade policy is multifold as it defines the framework of economic relations of a country with the test of the world. Therefore, it comes as no surprise the great interest for the trade policy effects and their potential effects of growth, social welfare and distributional equality (Beverelli, Boffa, & Keck, 2019; Niu, Milner, Gunessee, & Liu, 2020). However, economic efficiency is not always the only or even leading factor when determining the optimal trade policy mix. Namely, the process could be influenced by various political factors, such as interest groups' lobbying (Grossman & Helpman, 1994; Yu, 2000). The issue has become particularly important lately, with high level of interconnectedness of the world economy, and instability in trade policy of key world economies, that have long reaching effects in the majority of countries that are participating in global value chains (Ghodsi & Stehrer, 2022).

In this study, I examine one peculiar aspect of this optimal policy mix choice, focusing on interaction between tariffs and non-tariff measures. I seek to answer in what cases is substitution between the two more likely. In order to do this, I develop a deterministic model based on the protection for sale framework of weighted welfare maximizations. From this model I derive the conditions for the initial hypothesis – that tariffs and non-tariff measures are substitutes. I test this prediction empirically, by considering the case of Serbia. The country underwent significant trade liberalization process since the 2000s, resulting in considerable overall tariff reductions. This presents an interesting opportunity to investigate empirically if this process resulted in the rise of neo-protectionism.

The initial hypothesis was tested using the sample of tariffs and non-tariff measure usage across HS-2 sectors in the period between 2010 and 2021. The testing is based on estimating a static and dynamic model of non-tariff measure frequency of use, using the within regression estimator and system-generalized method of moments (Blundell & Bond, 1998). The results support the initial hypothesis, particularly in the case of technical measures.

The remainder of this paper is organized as follows. The following section presents the review of the related theoretical and empirical literature. Section 3 presents the deterministic model of weighted social welfare maximization resulting in comparative statics describing the relationship between non-tariff measure level of usage and tariffs. In Section 4, identification strategy is described, followed by empirical methodology and sample characteristics and data sources. Section 5 presents the results of empirical investigation of the effects of tariffs on non-tariff measure usage in the case of Serbia. Final section concludes.

2. LITERATURE REVIEW

Substitution of tariffs with non-tariff measures has been a topic in international trade theories, particularly in the context of trade liberalization and the constraints imposed by multilateral agreements. The theoretical frameworks revolve around political economy considerations, strategic policymaking, and the role of regulatory gaps in trade agreements. Baldwin (1984) was among the first to highlight the trend of policy instruments substitution, noting that as countries agreed to lower tariff rates, they increasingly turned to alternative trade barriers. This perspective is reinforced by Copeland (1990), who argued that trade agreements primarily focused on tariff reductions, leaving regulatory gaps that policymakers exploited by implementing NTMs.

Further, more formal theoretical developments extend this idea, incorporating political economy models that explain why policymakers opt for non-tariff measures when tariffs are constrained. Beverelli et al. (2019) built on the work of Grossman and Helpman (1994), demonstrating that when tariff reductions are externally imposed, policymakers, influenced by domestic producer lobbying, compensate for lost protection by introducing non-tariff measures. Similarly, Essaji (2010) analyzed how the introduction of standards, a common form of NTMs, affects production costs asymmetrically, typically disadvantaging foreign producers relative to domestic firms.

The substitution of tariffs with non-tariff measures is also explained through strategic policymaking and the incentives of governments to maximize domestic welfare while responding to lobbying pressures. For instance, Yu (2000) applied the approach based on game theory to show that policymakers choose between tariffs and non-tariff measures based on the strength of lobbying from producers and consumers. When tariffs are transparent and politically costly due to their impact on consumers, governments may opt for non-tariff measures, particularly voluntary export restraints, as a more politically viable alternative.

The theoretical literature on trade policy substitution highlights multiple dimensions of this phenomenon, ranging from trade liberalization-induced shifts to political economy considerations and strategic policymaking. The relationship has been tested in numerous empirical studies. Empirical literature testing the theories previously discussed presents mixed evidence, with no clear consensus.

Several studies support the substitution hypothesis. For instance, Beverelli et al. (2019) empirically test their own theoretical model, demonstrating a positive impact of tariff reductions on the likelihood of trade disputes related to technical barriers, particularly in OECD countries. Niu, Milner, Gunessee, and Liu (2020) convert non-tariff measures into ad valorem equivalents and find significant substitution effects across 60 countries from 2003 to 2015, except in OECD agricultural sectors. Kee, Nicita, and Olarreaga (2008) similarly establish sectoral heterogeneity, with substitution effects in industrial sectors but a complementary relationship in agriculture. Grüber and Reiter (2021) provide descriptive evidence of non-tariff measures during the period of intense trade liberalization, providing further support for substitution hypothesis. Additional empirical studies further corroborate the substitution effect (Bown & Tovar, 2011; Feinberg & Reynolds, 2007; Herghelegiu, 2018; Kuenzel, 2023). Some empirical studies imply particularly strong substitution effects in developing economies (Limão & Tovar, 2011; Moore & Zanardi, 2011; Ronen, 2017).

Other empirical studies report evidence of complementary relationship between non-tariff measures and tariffs. For instance, Beghin, Disdier, and Marette (2015) suggest that nearly 40% of analyzed non-tariff measures enhance trade rather than restrict it. Descriptive evidence of complementary relationship was also found in the case of Colombia (Goldberg & Pavcnik, 2005). More comprehensive and robust empirical tests in multi-country settings are in line with these findings (Dean, Signoret, Feinberg, Ludema, & Ferrantino, 2009; Lee & Swagel, 1997).

3. THEORETICAL FRAMEWORK

To motivate the empirical analysis of substitution between tariffs and non-tariff measures I develop a simple deterministic model. The model is based on the general framework of protection for sale proposed by Grossman and Helpman.(1994). In this regard, the model builds upon the model of Beverelli, Boffa and Keck (2019), who use the same framework to explore the substation effects of standards and tariffs by considering differences in marginal costs of compliance of domestic and foreign producers. I adopt a similar partial equilibrium framework, where I analyze the case of small, open economy importing a good. Also in line with aforementioned theory, I assume perfect competition and linear supply and demand curves. I depart from the existing framework in considering the effects of non-tariff measures (conceptualized as standards) on demand side, which has previously been abstracted. Namely, I consider the possibility that the introduction of standards (σ) positively affects the quality of products if they are set above some objective threshold of quality standard (σ_m). The demand for product is then defined as following linear function:

$$D(\sigma, \sigma_m, \tau) = b - cp + \gamma(\sigma - \sigma_m) \quad (1)$$

Where b, c, and γ are positive parameters and p is price of the good. If the standards are set above the minimal threshold, this contributes to the quality of good resulting in higher demanded quantity of good, all other things being equal. However, if the standards are below this threshold, it negatively affects the demand due to substandard quality of good. In line with the existing theories, in order to simplify the analysis I assume all the producers adopt only legally required standards. The supply is defined as:

$$y(\sigma, p) = p - \phi\sigma \quad (2)$$

where the supply quantity is dependent on market price and the level of standards, as well as the marginal cost of implementing the said standards (ϕ), which is assumed to be positive.

The country is assumed to be importer and not to export the good. Imports are defined as difference between demanded and supplied quantity:

$$M(\sigma, \sigma_m, \tau) = D(\sigma, \sigma_m, \tau) - y(\sigma, p) \quad (3)$$

The implication of the assumption of perfect competition and that the country is strictly importer that we made previously is that the effective domestic price of this small country will be determined by the world price, increased by tariffs (τ) and costs of conforming to standards the importing country sets for foreign producers ($\phi_s\sigma$). To simplify the analysis, I standardize the world price to 1, obtaining the expression for effective equilibrium price in the small importing country:

$$p *= 1 + \tau + \phi_s\sigma \quad (4)$$

By selling at equilibrium price, domestic producers get surplus:

$$\pi = \int_{\phi\sigma}^{p*} y(\sigma, p)\, dp \quad (5)$$

The effective equilibrium price is relevant not only for producers, but also for consumers. At that price, consumers get consumers' surplus defined as:

$$s = \int_{p*}^{\frac{b+\gamma(\sigma-\sigma_m)}{c}} D(\sigma, \sigma_m, \tau) dp \quad (6)$$

where the lower limit of integration is the equilibrium price, and the upper limit is the choke price obtained from Equation (1) by setting condition $D(\sigma, \sigma_m, \tau) = 0$.

I embed this set-up into the protection for sale framework. The focal point of the framework is that the policy makers choose optimal trade policy mix of instruments simultaneously maximizing total welfare in the country and being affected by domestic producers' lobbying. This is encapsulated by the following modified welfare function that policymakers optimize:

$$V(\sigma, \tau) = \pi + a(\pi + s + \tau M) \quad (7)$$

where a denotes a non-negative parameter that describes the importance policy makers place on domestic producers' interests. The higher the level of this parameter is, the lower importance is placed on domestic producers' interests and the closer this framework gets to standard social welfare maximization problem.

Policy makers are not entirely independent when setting tariffs, as they are constrained by the international regulations, primarily the regulations related to multilateral trading systems and international trade agreements in which the country participates. We have a related example of this in the European Union integration process of Serbia (Matkovski, Zekic, Savic, & Radovanov, 2018). I, thus, consider tariffs in the model to be bound to the value $\tau^{\sim}$, which is set by international obligations of the country. I formalize the decision process of the policy makers in small importing economy as the optimization problem, defined as:

$$\begin{gathered} \max V(\sigma, \tau) \text{ s.t.} \\ \tau = \tilde{\tau} \end{gathered} \quad (8)$$

From the optimization problem defined in Equation 8, I derive first order condition for optimal tariff rate, as:

$$\frac{\partial V(\sigma)}{\partial \sigma} = 0 \quad (9)$$

From here, I can derive optimal level of standards (non-tariff measures) (σ_u) introduced by policymakers, which results in maximized modified welfare function value. This optimal level of standards has infinitely many solutions as long as a condition for b parameter is satisfied. Such result is of limited usefulness, and it is difficult to interpret. However, we are primarily interested in substitution effect – i.e. under which conditions will decrease in tariffs result in increase in non-tariff measures. I can formalize this substitution effect as:

$$\frac{\partial \sigma_u}{\partial \tilde{\tau}} < 0 \quad (10)$$

Despite our complex solution of first-order condition, by invoking implicit function theorem, we can determine the condition in Equation 10 as closed-form inequality:

$$\frac{\partial \sigma_u}{\partial \tilde{\tau}} = \frac{a((1-c)\phi + (c-1)\phi_s - \gamma)) + 2(\phi - \phi_s)}{a\left((c+2)\phi^2 - 4\phi\phi_s + 2{\phi_s}^2\right) + 2(\phi - \phi_s)^2} < 0 \quad (11)$$

By solving this inequality, I derive conditions under which substitution between tariffs and non-tariff measures will occur. Since the denominator is always positive, the condition under which the substitution of trade policy instruments will occur comes from the nominator. Here, a crucial condition for policy instruments substitution is marginal costs of compliance advantage domestic producers have over foreign producers ($\phi < \phi_s$). In such circumstances, domestic producers will lobby for non-tariff measures introduction if tariffs are exogenously reduced, as such change increases or maintains their advantage over foreign producers on domestic market. The substitution will occur as long as the condition $(c-1)(\phi_s - \phi) - \gamma < 0$ is met. From this condition, we can clearly conclude that if domestic producers have compliance costs advantage, the substitution will occur as the demand for good traded is relatively inelastic ($c \leq 1$). In the case of such an inelastic good, that is, when consumers are not price sensitive, introduction of standards protects domestic producers while improving quality at the expense of raising prices of good. However, due to price insensitivity, such a change does not strongly affect the weighted welfare value. The substitution effect thereby grows with increase in compliance cost advantage of domestic producers and quality elasticity of demand.

On the other hand, in the case of elastic good, demand will react strongly to increases in prices caused by introduced standards, which cannot be as easily offset by increases in quality and protection of domestic producers. Our substitution condition also implies that substitution between tariffs and non-tariff measures will occur as consumers' sensitivity to quality grows, as introduction of non-tariff measures improves the quality of good, increasing the consumers' surplus, but only as long as the quality elasticity is larger than compliance cost advantage adjusted by price elasticity. It is also worth noting that these effects are proportionally scaled by the weight policymakers place on protection (the importance of lobbying).

The substitution can occur even if foreign producers have marginal compliance cost advantage, if the demand for good is more elastic and the condition $1 + \frac{2}{a} - \frac{\gamma}{\phi - \phi_s} < c$ is satisfied. This implies that for substitution to occur if domestic producers are at compliance disadvantage, policymakers need to prioritize social welfare in general compared to welfare of producers. In this case, policy instrument substitution is driven not by lobbying, but by general public interest. Additionally, the substation is more likely to occur in this case, as consumers are more sensitive to quality and as cost disadvantage of domestic producers is lower. Such result is a notable difference from the related model of Beverelli et al. (2019), where domestic producers' cost advantage is a necessary condition for trade policy substitution.

I further consider what happens if non-tariff measures are set at least at objective level that ensures sufficient quality demanded by consumers. I operationalize this as standard level denoted by σ_m. If such level of minimally and objectively required standard is possible to operationalize for policymakers, their decision regarding optimal non-tariff measures level becomes the optimal result of the following maximization problem:

$$\max V(\sigma,\tau) \text{ s.t.} \\ \tau = \tilde{\tau} \\ \sigma \geq \sigma_m \tag{12}$$

If the constraint set by minimal objective criterion for non-tariff measure is not binding, the maximization problem reduces to Equation 8, and the solutions previously discussed. However, if the constraint is binding, then according to Kuhn-Tucker conditions, the shadow price of minimally required standard for non-tariff measure (λ) needs to be strictly positive. Thereby, the shadow price is determined from first order condition of problem posited by Equation 12 as $\lambda = -\frac{\partial V(\sigma,\tau)}{\partial \sigma}\Big| \sigma = \sigma_m, \tau = \tilde{\tau}$. The condition $\lambda > 0$ is met (and, thus, $\sigma_u = \sigma_m$) if $\big(2 + a(c+2)\big)\phi^2 - 4(a+1)\phi\phi_s + 2(a+1)\phi_s^2 = 0$, and $\big((1-c)\tau + b - c + \gamma + 2 - \phi_s\big) + a\big((c+1)\phi_s + (c-1)\tau - 2\big)\phi_s + 2(\tau+1)(\phi - \phi_s) > 0$. These conditions are only met in the specific case of perfectly inelastic demand (*c=0*) and equal marginal compliance costs of domestic and foreign producers ($\phi=\phi_s$). Under those circumstances, policymakers will always set minimal standards required by consumers, and in such circumstances change in tariffs has no effects on optimal choice of non-tariff measures. Any standards higher than the minimum have no positive effect of social welfare, because they neither provide protection for domestic producers, nor affect consumption patterns.

The difference between optimal solution when minimal standard is binding or not binding depending on the relationship between marginal compliance costs of domestic and foreign producers is illustrated in Figure 1.

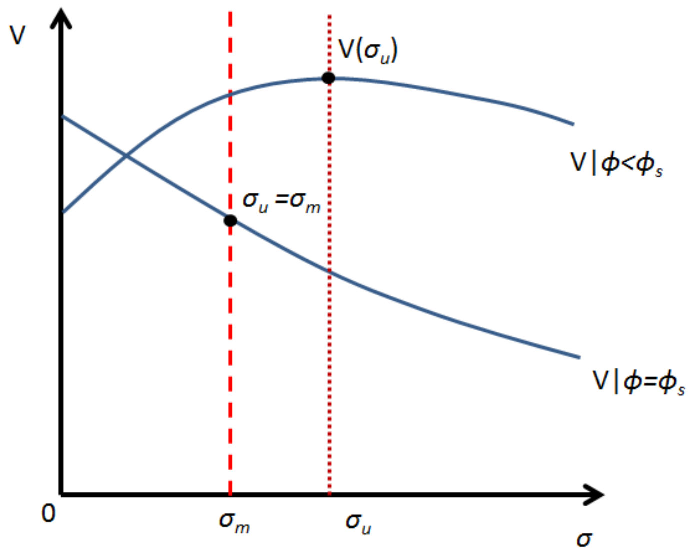

Figure 1: Illustration of policymakers' optimal choice of non-tariff measures
Source: Author.

Figure 1 depicts the relationship between social welfare (V) on the vertical axis and the level of the non-tariff measure (σ) on the horizontal axis. Two distinct social welfare curves are shown, both representing the relationship between V and σ for a fixed level of the tariff (τ). The first V-curve, denoted by $V|\phi < \phi_s$ represents the more likely scenario where domestic producers face lower marginal compliance costs than foreign producers ($\phi < \phi_s$). This curve reaches a higher maximum level of social welfare, as the increase in standards set by non-tariff measures positively affects both producers (who enjoy greater protection) and consumers (who enjoy higher quality of good). However, this increase is detrimental to trade, and under conditions previously explored at certain point further increase in non-tariff measures can start exhibiting negative effects of weighted welfare function. Larger marginal cost advantage of domestic producers increases the slope in value function, resulting in optimum at higher level of non-tariff measures and higher weighted welfare value. The other welfare V-curve, denoted by $V \mid \phi = \phi_s$ represent the special case I discussed previously, where domestic and foreign producers have equal marginal compliance costs ($\phi = \phi_s$).

A vertical dashed red line denoted by σ_m represents a minimum acceptable level for the non-tariff measure ensuring sufficient quality for consumers. This constraint could reflect necessary safety regulations or product quality standards that are objective and possible to quantify and are introduced into regulatory framework. A horizontal dotted red line indicates the unconstrained optimal level of the non-tariff measures, denoted as σ_u. This is the level of non-tariff measures that would be chosen if the minimum standard constraint were not binding, which is the case when domestic producers enjoy increase in protection from increasing standards.

As depicted, generally, numerical simulation of the model indicated that unconstrained choice of optimal non-tariff measures level results in higher weighted welfare than the result of the constrained choice. For the other perspective, we can also say that the model implies higher weighed welfare in the case where domestic producers have lower marginal compliance costs than foreign producers. This would usually be the case if the compliance requires specific knowledge of importing country's institutional and regulatory framework or if the standards set technological requirements and importing country has superior technology.

In the scenario depicting binding constraints faced by policymakers, the minimum standard will also be optimal standard level of non-tariff measures. However, this would lead to a decrease in welfare compared to unconstrained case. It is also worth noting that while tariff rates are held at fixed rate for the purpose of illustration, their exogenous changes tend to shift the welfare curves upwards and downwards. This reflects our main result stating that decrease in tariffs is compensated by increase in non-tariff measures by weighted welfare maximizing policymakers, in the case of lower marginal compliance costs of domestic producers. In the special case of equal marginal costs, changes in tariff do not affect the optimal choice of non-tariff measures.

Figure 1 shows that when domestic producers have a cost advantage in compliance, the overall social welfare achievable is higher for any given level of σ. This suggests that policies that lower domestic compliance costs, or situations where domestic firms are inherently more efficient at meeting standards, can lead to welfare gains. The fact that the constraint at σ_m is binding only in very special case implies that, in the absence of the constraint, policymakers would optimally choose the lowest non-tariff measures level possible. Only an objective criterion protecting interests of consumers is then holding the level of the non-tariff measures chosen. However, in most other cases, policymakers will choose the level of non-tariff measures that is higher than the minimum required by consumers.

It is worth noting that the domestic producers will lobby for higher standards when they have marginal cost advantage compared to foreign producers. However, in the special case of constrained optimum, they have an incentive to lobby for non-tariff measures reduction and it reduces their costs.

If the constraint is not binding, then maximum weighed welfare is achieved at point $V(\sigma_u)$. The results also imply weighted welfare loss from imposing minimal objective standard, even if marginal compliance costs of foreign and domestic producers are identical.

The illustration, as well as the deterministic model, highlights the importance of considering both compliance costs and the potential objective binding constraints in designing optimal trade policy. The analysis underscores that even when tariffs improve welfare, a binding minimum standard setting the level of non-tariff measures can limit the achievable level of social welfare, leading policymakers to choose a constrained optimum, decoupling non-tariff measure choice from exogenous changes in tariff rates. The results, though simplified, emphasize the significance of considering objective standards and regulations, as well as their effect of quality (and thus demand) in conjunction with traditional tariff policies.

We can also consider the main results of our model within broader historical context and concrete product groups. Namely, in general, due to liberalization of trade policies, tariffs have been continuously reduced over time for many products. The results of the model show why it is expected that such reductions are expected to result in increased use of non-tariff measures. In essence, the model presents a simple mechanism explaining why neo-protectionism occurs, particularly in small open economies. However, in specific cases of products with inelastic demand where production technology is largely standardized, and where there are scientifically-backed standards of production ensuring minimal quality and safety of products, we expect to see no effects in tariffs changes, whether the changes are positive or negative. A promising scenario for such an outcome is trade policy mix regulating international trade in agricultural commodities, where we could expect tariff hikes to result in maintained levels of non-tariff measures, severely restricting international trade.

4. METDHOLOGY

From the preceding theoretical model I derive the general hypothesis to be tested empirically in the remainder of this paper:

H1: The decrease in tariff rates causes the increase in the level of non-tariff measures use in the same country.

The hypothesis is conditional of marginal compliance cost advantage of domestic producers and either inelasticity of imported good's demand or high sensitivity of demand to quality with lobbying moderating the intensity of trade policy substitution. Moreover, if domestic producers are at marginal compliance cost disadvantage, the substitution could still occur for sufficiently low lobbying pressure or high quality sensitivity relative to demand elasticity of imported good. However, if the marginal compliance costs of foreign and domestic producers are the same, and there is an objective criterion codified in the importing country's legislature that ensures minimal quality standard of a good, and if such good's demand is inelastic, changes in tariffs for such goods will not affect non-tariff measures related to the same good. I rudimentarily operationalize this condition by separately observing the interaction between non-tariff measures use characteristic mostly for agricultural sector (the group of sanitary and phytosanitary measures) and for technical measures to trade. Considering that in the case of agriculture and sanitary and phytosanitary measures we have systematically more inelastic goods, convergence of production techniques across countries with production experience accumulation, leading to convergence in marginal compliance costs, and scientifically-backed and internationally recognized standards such as Codex Alimentarius (Beghin, Maertens, & Swinnen, 2015; Kastratović, 2023; Kastratović & Vasiljević, 2018), we expect that in this case it is more likely to observe insignificant effects of tariffs on non-tariff measures usage. I, thus, formulate the following sub-hypothesis accordingly, as:

H1a: The decrease in tariff rates does not affect the non-tariff measure usage in the case of agriculture in the same country.

Given the unobservability of marginal compliance costs and demand elasticities, I employ the following panel fixed-effects model:

$$NTM_{it} = \beta_{0i} + \beta_1 AT_{it-1} + \beta_2 IMP_{it} + \varepsilon_{it} \tag{13}$$

where i denotes HS-2 level sectors, t denotes years, NTM_{it} is the frequency index of NTMs at the HS-2 level measuring the proportion of HS-6 level products within a sector subject to at least one non-tariff measure of type A or B, AT_{it-1} represents the average tariff rates applied to sector in year, lagged by one year to mitigate reverse causality, IMP_{it} is the import value (in thousands of constant USD) for HS-2 sector, controlling for competitive pressure from foreign producers, and ε_{it} is the error term. To account for lobbying effects, I extend the model with a lobbying dummy () interacting with tariffs::

$$NTM_{it} = \beta_{0i} + \beta_1 AT_{it-1} + \beta_2 AT_{it-1} \times L_t + \beta_3 L_t + \beta_4 IMP_{it} + \varepsilon_{it} \tag{14}$$

where all terms represent the same variables and indices as equation 13, and L_t is a dummy variable indicating the introduction of Serbia's Law on Lobbying in 2018, which institutionalized lobbying and increased transparency in this activity. If lobbying moderates trade policy substitution, we expect the slope coefficient for L_t to be significantly negative.
To address endogeneity concerns, I follow Beverelli et al. (2019) and Niu et al. (2020) by lagging tariffs variable. Additionally, I test strict exogeneity (Wooldridge, 2002, p. 285), by estimating:

$$NTM_{it} = \beta_{0i} + \beta_1 AT_{it+1} + \beta_2 IMP_{it} + \varepsilon_{it} \tag{15}$$

which represents the baseline model adjusted by considering the effects of leads of tariffs (rather than lags) on non-tariff measure usage. If such effects are statistically insignificant, it would support the assumption that tariffs are exogenous.
Given the potential persistence of non-tariff frequency over time, and the suitability of the sample with relatively short time frame, I additionally estimate a dynamic panel model, which is particularly suitable in such case (Kastratović, 2019):

$$NTM_{it} = \beta_{0i} + \beta_1 NTM_{it-1} + \beta_2 AT_{it+1} + \beta_3 IMP_{it} + \varepsilon_{it} \tag{16}$$

The dynamic model is estimated using the Blundell-Bond system generalized methods of moment approach. Thereby I use Windmeijer's correction to ensure robustness of standard errors (Windmeijer, 2005). To address Nickel's bias, we consider the lagged non-tariff measures variable as endogenous (Nickell, 1981). For previously discussed reason, the same was done for tariffs and imports variable. In this way, I directly address the endogeneity problem, while accounting for potential persistence of non-tariff measure's coverage of products over time.
The sample includes data on frequency indices by HS-2 level, calculated by the author for Serbia in the period between 2010 and 2024. The descriptive statistics for the sample is presented in Table 1.

Table 1: Descriptive Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
NTM-A_{it}	1440	51.70	48.72	0	100
NTM-B_{it}	1440	77.55	35.40	0.50	100
AT_{it}	768	12.11	9.80	1.05	49.34
IMP_{it}	768	402,559	889,719	429	7,422,724
L_t	1440	0.46	0.50	0	1

Source: Author's calculation.

The basis for this calculation was extensive database of all non-tariff measures in Serbia, obtained by performing content analysis across the entire regulatory framework of the Republic of Serbia, resulting in information at HS-6 level about the types of non-tariff measures introduces, their date of introduction, and affected countries. By aggregating this data on HS-2 level, I am able to retrieve the number of HS-6 codes within HS-2 sectors that have at least one matching non-tariff measure active in the given year. This sum is then divided for every HS-2 sector with total number of HS-6 codes within each HS-2 sector (Disdier & Fugazza, 2019), which was obtained from comprehensive Harmonized System Classification. This provides a large dataset of 1440 observations describing non-tariff measure usage in Serbia in the considered period. This dataset was matched by HS-2 code with tariff and import value data provided by the World Bank, via World Integrated Trade System. This data was not as comprehensive, which limits the sample size to 768 observations and the timeframe of the analysis to 2010-2021.

5. RESULTS AND DISCUSSION

In this section, I present the results of empirical model estimations indicating the existence and the extent of substitution between tariffs and non-tariff measures in the case of Serbia. Table 2 presents the baseline static model estimation result. Columns NTM-A and NTM-B refer to the estimations of Equation 13, for two operationalizations of the dependent variable – sanitary and phytosanitary measures (type A) and technical measures (type B). In classifying the measures for constructing the dependent variable I followed the classification of the United Nations Conference on Trade and Development. The next two columns refer to the extended model denoted by Equation 14. Finally, the last two columns show the results of strict erogeneity testing.

The baseline specification indicates possible complementary relationship between tariffs and sanitary and phytosanitary measures. In contrast, there is strong evidence of substation between tariffs and technical measures. The coefficient indicating the effects of tariffs on sanitary and phytosanitary measure is statistically significant at 10% level. It indicates that liberalization of trade by reducing tariffs by one per cent point leads to the reduction of coverage of sanitary and phytosanitary measures by 0.67 per cent points within HS-2 sectors on average. Coefficient reflecting the effect on tariffs on technical measures is significant at 1% level, indicating that a reduction of tariffs by one per cent point leads to the increase of non-tariff measure coverage within HS-2 sectors by approximately 4.18 per cent points on average. Such results indicate possible liberalization processes specific to agriculture, whereas in the manufacturing sector we can observe tendency of maintaining the protection of domestic producers with tariff liberalization.

The extended model does not fit well the specific case of sanitary and phytosanitary measures, as evidenced by the lack of statistical significance of that specification as a whole. However, the fit is considerably improved for technical measures model, indicated by significant increase in both F-statistics and coefficient of determination. We observe the effects that are consistent with theoretical expectations. Namely, the institutionalization of lobbying in the Republic of Serbia was found to significantly scale substitution effects. In the absence of lobbying, there is statistically significant effect of tariff reduction on non-tariff measures increased use, which is significant at 1% level, similarly to the baseline model. However, we can see that when lobbying is present in institutionalized form, the economic effects of tariffs on non-tariff measures' usage grow by additional 0.53 per cent points. Lobbying institutionalization in itself also has a significant effect on non-tariff measure usage, as evidenced by the corresponding coefficient which is statistically significant at 1% level.

Table 2: Baseline Static Model Estimation Results

Variable	NTM-A	NTM-B	NTM-A	NTM-B	SET: NTM-A	SET: NTM-B
AT_{it-1}	0.673* (0.361)	-4.148*** (0.956)	0.607 (0.377)	-2.865*** (0.862)		
AT_{it+1}					-0.038 (0.072)	-5.048*** (0.069)
IMP_{it}	-7.84×10^{-7} (9.78×10^{-7})	8.99×10^{-6} (1.43×10^{-5})	-7.65×10^{-7} (9.24×10^{-7})	-3.37×10^{-6} (7.73×10^{-7})	-3.36×10^{-7} (3.25×10^{-7})	16.2×10^{-6} (7.48×10^{-6})
$L_t \times AT_{it-1}$			-0.120 (0.094)	-0.535* (0.312)		

L_t			1.027 (0.744)	35.360*** (5.037)		
Intercept	45.976*** (4.290)	118.233*** (12.864)	46.802 (4.547)	100.800*** (10.500)	52.260 (0.922)	120.851 (9.165)
Observations	384	384	384	384	672	672
F-statistics	2.43*	9.89***	1.57	31.49***	0.55	31.26***
Within group R^2	0.04	0.06	0.05	0.26	0.00	0.15

Note: *** and * denote significance at 1% and 10% significance levels, respectively. All specifications include fixed effects. Robust standard errors clustered at HS-2 level are presented in parentheses.

Source: Author's calculation.

While strict exogeneity testing indicates we can rely in conclusions on our static model of sanitary and phytosanitary use, it indicates that endogeneity was not completely eliminated by the use of lags in the case of technical measures' specification. For this reason, I address the endogeneity problem more directly by instrumentalizing tariffs and imports with their lagged variables.

Considering the specific nature of our dependent variable and the panel structure of the sample, I base this approach in estimating the effects of tariffs on non-tariff measures use on dynamic panel estimation to check the robustness of our initial conclusions. The results of this estimation are presented in Table 3. The diagnostics indicate that this is not a valid approach for the specification describing the use of sanitary and phytosanitary measures (column NTM-A), as the level of persistence is unrealistically high, no autocorrelation of first order was found in the residual of differences equation and the Hansen test indicates that the instruments used in the estimation are not valid. However, the same diagnostic tests indicate the validity of specification and the chosen instrument in the case of technical measures model (denoted as NTM-B in Table 3).

Table 3: Dynamic Model Estimation Results

Variable	NTM-A	NTM-B
NTM_{it-1}	0.982*** (0.117)	0.697*** (0.031)
AT_{it}	0.079 (0.053)	-0.897** (0.433)
IMP_{it}	-1.57×10^{-7} (1.79×10^{-7})	-3.78×10^{-7} (5.41×10^{-7})
Intercept	0.844 (1.114)	39.230*** (6.440)
Observations	672	672
Number of groups	96	96
Number of instruments	64	80
F-statistics	3733.50***	270.18***
AR(1)	0.317	0.063
AR(2)	0.312	0.836
Hansen test	0.015	0.083

Note: ***, **, and * denote significance at 1%, 5% and 10% significance levels, respectively. Robust standard errors are presented in parentheses. AR(1) and AR(2) refer to p-values of Arellano-Bond test for autocorrelation of first and second order in first differences. Hansen test refers to p-value of Hansen test of overidentifyng restrictions.

Source: Author's calculation.

The estimates confirm the initial finding of significant substitution effect of tariff reductions. Namely, the results suggest that the reduction in tariffs by one per cent point, causes the average increase in non-tariff measure usage within HS-2 sectors by the nearly same extent in the short run. The corresponding coefficient is statistically significant at 5% level. When we account for persistence, this effect nearly triples in the long run. The estimation results also show significant persistence in the use of non-tariff measures. This could potentially indicate a ratchet effects in the use of non-tariff measures, meaning that once introduced for some products, the non-tariff measures remain in the long run. This emphasized the perils of the use of neo-protectionism, which could be difficult to counter in the future, particularly if the multilateral trading system does not continue with the liberalization processes and greater regulation of their use.

6. CONCLUSION

In this study, I examined possible substitutive relationship between tariffs and non-tariff measures. Using a simplified theoretical framework based on perfect competition and weighted welfare maximization describing small open economy, I show that substitution occurs if domestic producers have marginal compliance cost advantages if the products are relatively inelastic or consumers' sensitivity to quality is significantly stronger that their price sensitivity.

Moreover, substation could also occur in the case of marginal compliance cost disadvantage of domestic producers if lobbying is less prioritized by the policymakers, the consumers are more sensitive to product quality, and price elasticity is relatively large. Finally, I show that if minimal standards of quality are binding by the regulation of importing country and if the marginal compliance costs are comparable (which is expected in more traditional production sectors with more scientific and internationally recognized production standards) the substitution effects are insignificant.

I empirically test this prediction by using a detailed dataset of non-tariff measures combined with data on average tariff rates observed in Serbia in the period between 2010 and 2021 at HS-2 level. The testing was based on static and dynamic panel data models estimations which employed within regression estimator and system-generalized method of moments, respectively. I find tentative evidence of possible complementary relationship between tariffs and the use of sanitary and phytosanitary measures, which was not robust to changes in specification. However, substitution effects are significant and robust in the case of technical measures, supporting the main initial hypothesis. This could reflect characteristics of the products to which the measures generally refer. Namely, in the case of industrial products there is greater heterogeneity of standards across countries, as well as greater potential pressures for protection due to lower competitive advantage of domestic producers compared to the foreign ones. To the contrary, in the case of sanitary and phytosanitary measures, we mainly observe effects in products related to agriculture, where Serbia possesses much stronger competitive advantage and where there are more internationally binding and scientifically-backed production standards mandating similar requirements (and causing similar compliance costs) for both domestic and foreign producers. We can, thus conclude that the empirical analysis supports initial hypothesis, particularly in the case of substitution between tariffs and technical measures. In addition, these substitution effects are scaled by institutionalization of lobbying in the Republic of Serbia, which is also in line with theoretical predictions.

There are a few limitations to this study that need to be taken into account when interpreting these results. First, there could be some measurement error in the dependent variable, as it measures frequency of measures within the sectors, but not the extent of their restrictiveness. Moreover, the simplifying assumption of this index means that instances of single or multiple non-tariff measures of a particular type are treated equally. The operationalization of dependent variable also cannot account for possible measures that could be trade facilitating, such as changes in procedures implementing the use of information and communication technologies (Kastratović & and Bjelić, 2022). Furthermore, the results could be affected by aggregation bias, as the substitution dynamics are analyzed at the sector rather than product level, which would be more consistent with the theoretical framework. For this reason, future studies of substitution effects should be based on lower level of aggregation, both in terms of Harmonized Classification level observed and the types of non-tariff measures.

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