Effect of non-tariff measures on the spice exports of Sri Lanka: a gravity approach

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1. Introduction

The spice sector is one of the important sources of generating foreign exchange for Sri Lanka. Sri Lanka has a comparative advantage with higher quality spices, and hence there is an opportunity in the international market that is yet to be exploited. To penetrate such markets, adhering to the certain regulations and policies in the importing countries becomes pivotal. These regulatory measures are commonly referred to as Non-tariff Measures (NTMs). According to the United Nations Conference on Trade and Development (UNCTAD, 2015), NTMs are defined as any trade policy instruments used to regulate international trade other than ordinary tariffs. This study focuses on quantitatively analyzing the impact of NTMs on Sri Lankan spice exports. There is a dearth of studies conducted in Sri Lanka investigating the link between NTMs and spice exports. To fill this gap, this study uses a detailed dataset and a gravity model to identify the key drivers that determine spice exports from Sri Lanka.

2. Materials and Methods

A panel dataset was constructed after extracting data from several databases[1]. Data were extracted from 2001 to 2017 from the top 12 spice exporting countries (Canada, Egypt, France, Germany, India, Mexico, Pakistan, Saudi Arabia, Spain, U.A.E., UK, USA) across 18 product categories[2] at the HS-6-digit level for pepper, cinnamon, clove, nutmeg, mace, and cardamom. For NTMs, the standard classification of the UNCTAD (2015) was used and data were collected for Sanitary and Phyto-sanitary Measures (SPSs), Technical Barriers to Trade Measures (TBTs), and other types of NTMs which were applied for the selected spices.

Trade literature elicits several analytical techniques used in gravity modelling (Weerasooriya, 2021). Out of these, the Poisson Pseudo Maximum Likelihood (PPML) regression model was used to counter the highly heteroskedastic error term and the presence of zero trade flows (Santos Silva & Tenreyro, 2006). The following two regression equations were estimated using PPML.

$$X_{ijt}^{k} = \beta_0 + \beta_1 \ln(GDP)_{it} + \beta_2 \ln(GDP)_{jt} + \beta_3 ln(POP)_{it} + \beta_4 ln(POP)_{jt} + \beta_5 \ln(DIS)_{ij} + \beta_6 colony_{ij} + \beta_7 ln(1 + tariff)_{ijt}^{k} + \beta_8 bsps_{ijt}^{k} + \beta_9 btbt_{ijt}^{k} + \varepsilon_{ijt}^{k}$$

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[1]Export value data: Trade Map and UNCOMTRADE, GDP and population data: World Bank Database, the distance between bilateral trade partners and common colonies: Institute for Research on the International Economy (CEPII), tariff rates: World Integrated Trade Solutions (WITS), NTMs: Trade Analysis Information System (TRAINS) of the UNCTAD.
[2]Pepper: HS090411, HS090412 Cinnamon: HS090610, HS090611, HS090619, HS090620 Clove: HS090700, HS090710, HS090720 Nutmeg: HS090810, HS090811, HS090812 Mace: HS090820, HS090821, HS090822 Cardamom: HS090830, HS090831, HS090832

where X_{ijt}^{k} is the export value of product k to the i[th] importing country from Sri Lanka at time t, GDP_{it} and POP_{it} are the gross domestic product and population of i[th] import country at time t, $GDP_{jt}$and POP_{jt} are the gross domestic product and population of Sri Lanka at time t, DIS_{ij} is the distance between the capital of the i[th] import country and the capital of Sri Lanka, $Tariff_{ijt}^{k}$ is the tariff rate imposed by country i for exported product k from Sri Lanka, $bsps_{ijt}^{k}$, and $btbt_{ijt}^{k}$ are dummy variables where 1 if SPS or TBT measures in country i are present for the exported product k from Sri Lanka at time t, and 0 otherwise respectively, $btotntm_{ijt}^{k}$ is a dummy variable where 1 if NTM measure in country i is present for the exported product k from Sri Lanka at time t and 0 otherwise, $colony_{ij}$ is a dummy variable where 1 if country i and Sri Lanka were in a colonial relationship and 0 otherwise, and ε_{ijt}^{k} and v_{ijt}^{k} are the error term. The Ad-valorem equivalent was computed to compare the effects of NTMs and tariffs using the method which was suggested by Kalaba and Kirsten (2012) and Weerasooriya (2021).

3. Results and Discussion

All the variables showed an increasing trend with the time except for distance and colony. The Cinnamon "Cinnamomum zeylanicum Blume" (excluding crushed and ground) (HS090611) is the highest exported spice whereas Cinnamon and cinnamon-tree flowers (excluding cinnamon "Cinnamomum zeylanicum Blume" and crushed and ground cinnamon) (HS 090619) is the least exported. It was found that cinnamon is highly regulated through NTMs and nutmeg, mace, and cardamom also had similar regulations. SPS measures contributed 63% of the total NTMs followed by TBT measures (15%) and other types of NTMs (22%) for Sri Lankan spices. From 2001 to 2017, tariff rates on spice exports have declined whereas NTMs have increased as shown in Figure 1. This highlights the importance of NTMs in the export of spices.

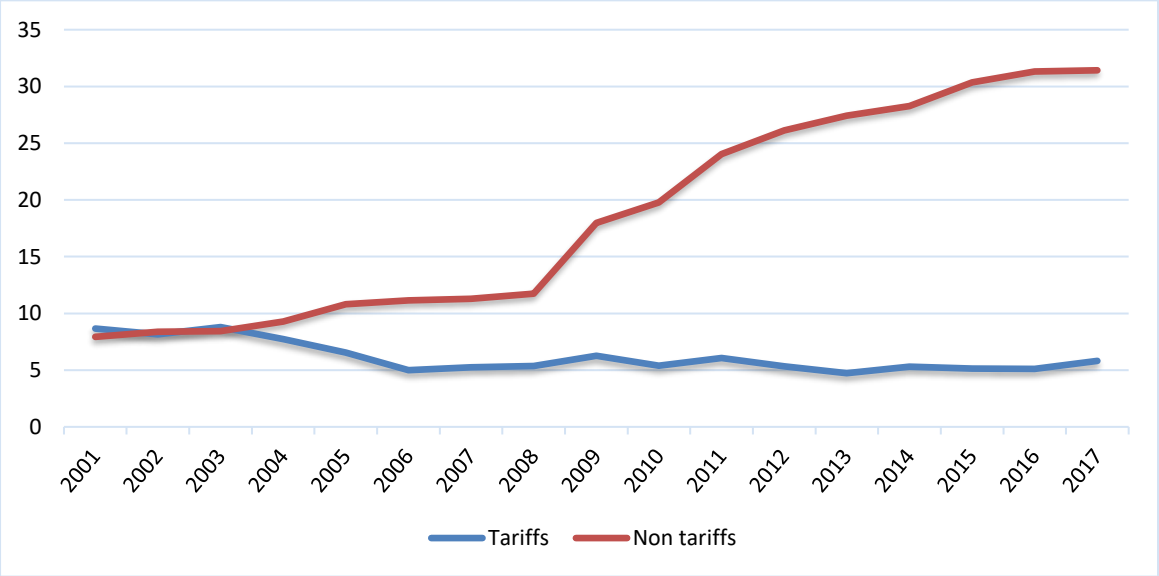

Figure 1. NTM frequency and average tariff rates from 2001 to 2017
(Source: Author's calculation based on WTO and TRAINS database)

The disaggregated type of NTMs applied for all types of spices are requirements for the restricted use of certain substances in foods and feeds and their contact materials (A22), labelling requirements (A31), labelling and directions for use (B31), packaging requirements/restrictions on materials to be used when packaging (A33), licensing, permit, registration requirements for exports (P33), and inspection requirements (A84).

Table 01. Results of the PPML estimation

Variables	Coefficients of the 1st model	Coefficients of the 2nd model
$\ln(GDP)_{jt}$	0.716 (0.712)	0.858 (0.700)
$\ln(GDP)_{it}$	-1.494* (0.271)	-1.132* (0.212)
$ln(POP)_{jt}$	1.841 (11.768)	-0.654 (11.688)
$ln(POP)_{it}$	2.627* (0.317)	2.429* (0.297)
$colony_{ij}$	0.103 (0.322)	0.036 (0.330)
$\ln(DIS)_{ij}$	2.501* (0.408)	2.094* (0.344)
$ln(1+tariff)_{ijt}^{k}$	-0.499* (0.137)	-0.442* (0.136)
$bsps_{ijt}^{k}$	-0.828* (0.360)	-
$btbt_{ijt}^{k}$	1.099* (0.390)	-
$btotntm_{ijt}^{k}$	-	-0.483* (0.254)
$Constant$	-25.234 (32.491)	-17.740 (32.375)

Robust standard errors are in parentheses
*Significance at 5% level

Two models were estimated using PPML. The first model included the dummy variables of specific types of NTMs (i.e., SPS and TBT). Based on the results shown in Table 1, the GDP of the importing country, the population of the importing country, distance, tariff, SPSs, TBTs are statistically significant ($p<0.05$). The GDP of Sri Lanka, the population of Sri Lanka, and the dummy for the colony were not statistically significant ($p>0.05$). Also, the GDP of the importing country, tariffs, and SPS measures have a negative effect whereas the population of the importing country, distance, and TBT measures have a positive effect on Sri Lanka's spice exports.

A 1 percent increase in the GDP of the importing country decreases the spice exports by 1.494 percent, and a 1 percent increase in the tariff decreases the spice exports by 0.499 percent. When SPS were imposed, the spice exports decreased by 56.3 percent ($e^{-0.828}-1=-0.563$), and surprisingly when TBT measures were imposed, the spice exports increased by 200.1 percent ($e^{1.099}-1=2.001$).

The second model included the dummy variable for total NTMs. The results of the second model are in line with the first model. According to the results of the second model, a 1 percent increase in the GDP of importing countries decreases the spice exports by 1.134 percent. A 1 percent increase in the tariffs decreases the spice exports by 0.442 percent. When any kind of NTM was imposed, the spice export decreased by 38.3 percent ($e^{-0.483}-1=-0.383$). Ad-valorem equivalent of total NTMs had an equivalent tax of 1.98 percent increase on spice exports. Further, SPS contributed to increasing spice exports by an equivalent tax of 4.30 percent whereas TBT decreases the exports prices by an equivalent tax of 0.90 percent.

4. Conclusions

SPS measures and total NTMs have a negative effect on spice exports of Sri Lanka whereas TBT measures have a positive effect on Sri Lankan spice exports. Therefore, the combined result could have a mixed effect on spice exports. This highlights the importance of NTMs in shaping spice trade and hence would help promote spice growers and policy makers to be aware and understand how NTMs work and how they can influence exports.

5. References

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