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An Analysis of the Tariff and Non-Tariff Barrier on Global Cottonseed Oil Trade

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ABSTRACT

This study is conducted to estimate the effect of both tariff and non-tariff barriers on global crude cottonseed oil, refined cottonseed, and cottonseed oil. This effect is estimated for a sample of developed and developing countries using data over the period 2005 to 2015. The study employed three maximum residue limits (MRL) indices, namely Li and Beghin, Actual Heterogeneous Index (AHI) and Heterogeneous Index (HI) as well as two estimation techniques, Poisson and Ordinary Least Square method (OLS). Marginal effects are obtained by using the Poisson technique. Estimated parameters such as distance, common border, PTAs, are found significant and according to prior expectations. The role of tariffs is more substantial in the oilseed trade compared to the trade in cottonseed crude oil. It is also found that the estimated elasticity by using Poisson technique is highly elastic as compared to OLS method. However, the aggregation of commodities at a higher level, as in the case of cottonseed oil, shows that the effect of the tariff on trade becomes statistically insignificant. Further, cottonseed crude oil is a major commodity affected by tariffs, particularly in the case of trade between North-North and North-South countries. Finally, the effect of tariffs on cottonseed refined oil trade was found insignificant.

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1. Introduction

Cotton is a major worldwide commercial cash crop and primary source of fiber. Cotton is also used to produce more food for humans and feed for animals. Cottonseed is a byproduct of cotton, which further consists of hull and kernel. The hull of the cotton seed produces fiber and lint while, kernel carries protein, oil, carbohydrates, vitamins, and minerals. The top five cottonseed oil producers are China, India, Pakistan, the United States, and Uzbekistan. Cottonseed oil is further a by-product of cottonseed and an important source of edible oil. Cottonseed oil is also known as "Heart oil" which is one of the most unsaturated edible oils. The quality of cottonseed oil depends on time, place and season in which cotton plant is located in the field. Furthermore, the high-quality cottonseed oil is produced in dry weather and low-quality cottonseed oil is produced in wet weather conditions. The crude cottonseed oil has good stability due to the presence of gossypol on cottonseed (Bambawale et al., 2004).

During the refining process, gossypol is removed from cottonseed oil. It is a natural toxin that protects cotton plants from naturally damaging insects and shields cotton plants (Kanoi, 2005). Non-refined cottonseed oil is also used as a pesticide. It is used in cosmetics, laundry detergents and insecticides. The cottonseed oil contains a high concentration of vitamin E, fatty acid, and antioxidants that are beneficial to human skins, moisturizing, anti-aging, and anti-inflammatory properties. Crude oil also contains a chemical called as aflatoxins that has a strong flavor and odor. These are extracted to turn crude oil into excellent edible oil during the refining process. Being healthy food, its demand has been growing gradually, and thus creating market expansion opportunities for cotton. The gossypol present in cottonseed not only acts naturally against predators but also makes insects infertile by reducing sperm production in male insects. The Codex Committee of 1967 declared that gossypol is not a health hazard as it is removed during the refining process.

The stored value of cottonseed oil is also good and is comparable with other edible oils (Abdelhameed 2013). Cottonseed oil is better than other edible oils as it lasts a long time in a relatively high temperature due to its anti-oxidant contents. Like olive oil, cottonseed oil consists of polyunsaturated fatty acids that helps in lowering LDL (“bad” cholesterol) and increase HDL (“good” cholesterol).

Non-tariff barriers (NTBs) can significantly restricts trade among nations. Otsuki, Wilson, and Sewadeh (2001) estimated the effect of protectionist measures on the imports from Africa to European Union (EU). They found a negative relationship between the imports from Africa to EU due to these NTBs. Beghin & Bureau (2001) concluded that the non-tariff barriers have a necessary role in future trade agreements. They argued that the governments are required to be abreast of the costs MRL policies and to accordingly frame the policies keeping them in view.

There has been a dearth of understanding of the effect of MRLs on trade among developed countries or developing countries in the case of cottonseed oil. Therefore, an estimation of the effects of tariffs and non-tariff barriers will highlight the importance of MRLs on countries' trade. Finally, it is also not known whether MRLs and tariff effects on trade are similar or different. Similarly, what is the nature of these effects among developing countries and developed countries? Researchers, Policymakers, investors, and entrepreneurs need such knowledge for their decision making.

The present study focuses on the impact of NTMs and tariff on global cottonseed oil trade. The reasons for focusing on the global cottonseed oil trade for the study are as follows: the impact and incidence of NTMs in the cottonseed oil sector are great and need attention. Usually, trade restriction in this sector is related to shipments, labeling and marking requirements. In the USA, trade restrictions are in the shape of security parameters, document verification at ports while the restriction imposed by the EU in this sector comprises of issues relating to compliance with labor and environmental norms. The imports and exports of cottonseed oil are greatly affected as tariff rates are reduced (Saini & Gordhan, 2007). Several studies are available where the effects of NTMs on specific countries’ trade are studied; however, not many focus on the effect of NTMs on global cottonseed oil trade.

2. Econometric Modelling

The conceptual model used in the study is based on the Haq, Meilke, and Cranfield (2013) and Haq and Meilke (2009, 2010). This study extended their model by considering non-tariff measures in the analysis. The model assumes that consumer in each importing country I maximize a constant elasticity of substitution (CES) utility function from the consumption of imported cotton product k subject to his income constraint I. The maximization problems assume that consumer has perfect information involved in the choice problem. Preferences are complete, reflexive and continuous. The consumer is assumed to be price taker i.e. prices are fixed and exogenous. Hence, the search for better prices, bargaining, and discount are ignored. Further prices are linear, and every unit of the cotton and textile product cost the same price. Hence, quantity discounts are assumed away. The maximization theory also assumes that goods are divisible. Cotton products are assumed to be differentiated. Hence, a country *I* are assumed to have a consumption bundle of homogenous and differentiated products. The utility function for a representative consumer in the country *i* is defined over homogenous (*Xh*) and differentiated (*Xf*) cotton products where $f = 1$, F and $h = F + 1$, *H*. Preferences for differentiated products are assumed to be weakly separable such that

$$U_i = U\left(u_1, u_2, \cdots, u_F, u_{F+1}, \cdots, u_H\right) \quad (1)$$

Where the general utility function U consists of sub utility functions u_h and u_F . The subs utility function u_F is assumed to be additively separable such that expenditure E_i on differentiated cotton products (X_f) in terms of the numeraire good X_h for country i is given as $E_i = X_{ih} + \sum_{f=1}^{F} P_{if} X_{if}$ and P_{if} is the price of cotton products f. Non-satiation is assumed implying that total expenditure is equal to income. The subs utility function u_F is assumed to have a (Dixit & Stiglitz, 1977) CES utility function to allow for substitution between differentiated products.

$$U_f = \left(\sum_{n=1}^{N} X_n^{\rho}\right)^{1/\rho} \quad (2)$$

Where U_f is defined over varieties n∈N of differentiated products in country i, and $0 < \rho < 1$ to preserve concavity. Maximizing the utility function (2) subject to the income constraints yields the following demand function for each variety of cotton products.

$$X_{in} P_{in} = \frac{\left(P_{in}\right)^{\frac{\rho}{1-\rho}}}{\sum_{n=1}^{N} \left(P_{in}\right)^{\frac{\rho}{1-\rho}}} I_i \quad (3)$$

Where X_{in} represents the demand for variety n in a sector of country i, P_{in} represents the price of each imported variety and I_i represents per capita income of the country. Hence, $X_{in} P_{in}$ represents the expenditure on imports of country i on variety n and is presented by M_{in}. The relationship between import price of a variety P_{in} and export price of the same variety P_{jn} is given as follows.

$$P_{in} = P_{jn} * \tau_{ijn} \quad (4)$$

Where τ_{ijn} is the trade cost faced by exporting country j in exporting product variety n to country i. substituting for P_{in} and taking the natural logarithm on both sides of equation 4 gives the following function.

$$\ln M_{in} = \ln N + (1-\sigma)\ln P_j - (1-\sigma)\ln \sum_{n=1}^{N} P_i + (1-\sigma)\ln \tau_{ijn} + \ln I_i \quad (5)$$

Trade costs, τ_{ijn} are determined by distance between trading partners (D), trade partners sharing a common border (B), tariff (T) and non-tariff barriers (NTB), preferential trade agreements (PTA), preferential market access such generalized system of preferences (GSP). Jacks, Meissner, and Novy (2008), Haq et al. (2013) and Haq and Meilke (2010, 2009) have such a relationship in their analysis. However, this study contributes to the existing literature by explicitly considering non-tariff barriers in the analysis. We are unaware of a study that has considered both tariff and MRLs effects in the same study.

$$\ln(\tau_{ijn}) = \theta_1 D_{ij} + \theta_2 B_{ij} + \theta_3 T_{ijn} + \theta_4 MRL_{ij} + \theta_5 PTA_{ij} + \theta_5 GSP_{ij} + v_{ij} \quad (6)$$

Jacks, Meissner and Novy (2008) estimated equation 6 assuming a value for the substitution elasticity and then included the estimated cost in the bilateral trade equation. The parameterized form is given as follows:

$$\ln M_{in} = \ln N + (1-\sigma)\ln P_j - (1-\sigma)\ln \sum_{n=1}^{N} P_i + (1-\sigma)\gamma_1 \ln D_{ij} + (1-\sigma)\theta_2 B_{ij} + (1-\sigma)\theta_3 T_{ijn} + (1-\sigma)\theta_4 MRL_{ij} + (1-\sigma)\theta_5 PTA_{ij} + (1-\sigma)\theta_5 GSP_{ij} + \theta_6 \ln I_i + \varepsilon_{ij} \quad (8)$$

In the above equation, lnN and P_j are specific to the exporting country and will be captured using exporter fixed effects (λ_j), while $\sum_{n=1}^{N} P_i$ is importing country specific and will be captured by importer fixed effects (λ_i). Haq et al. (2013) and Haq and Meilke (2010, 2009), Mátyás (1997) and Egger (2002) used these effects to control for unobserved heterogeneity. The $\varepsilon_i^j = (1-\sigma_f)v_{if}^j$ is the error term and it is assumed to be uncorrelated with the repressors. Further simplification of equation 8 yields the following estimable equation.

$$\ln M_{in} = \lambda_i + \lambda_j + \gamma_1 \ln D_{ij} + \gamma_2 B_{ij} + \gamma_3 T_{ijn} + \gamma_4 MRL_{ij} + \gamma_5 PTA_{ij} + \gamma_6 GSP_{ij} + \gamma_7 \ln I_i + \varepsilon_{ij} \quad (9)$$

The variable MRL can be measured in many ways.

3. Results and Discussions

This section presents the results of the model estimated for crude oil, refined cottonseed oil and the combination of the both crude and refined oil. Both Ordinary Least Squares (OLS) and Poisson estimation procedures were used. The analysis used three different MRLs indices namely Li and Beghin (LB), Actual Heterogeneous Index (AHI) and Heterogeneous Index (HI). The combination of three commodities, two estimation techniques and three measures of MRLs produces eighteen regression estimates for each coefficient.

The tables for cottonseed show that the total numbers of observations are 2,062. However, only 710 observations are left for the analysis when zero trade-flow is omitted. Hence, two-third of the observations is zero trade flows. Similarly, in the case of crude seed oil three-quarter of the observations are zero-trade flow while it is two-third for the refine oilseed. Hence, on overage only one-third of the observations are used in the OLS regression analysis as with logarithm specification, zero observations become missing and therefore Poisson regression is used too.

In the case of R-squared, it ranges from 0.563 for refined seed oil to 0.666 for crude seed oil. In the case of regression analysis, R-squared is an important indicator for at least three reasons. First, it explains the variability of the dependent variable from its mean that is the proportion of the total variation as unexplained by the model. Second the denominator of the R-squared formula (that is $R^2 = 1 - \frac{\sum_{i=1}^{n}(y_i-\hat{y}_i)^2}{\sum_{i=1}^{n}(y_i-\bar{y}_i)^2}$) represents sum of the squared errors of the null model. The null model shows the predicting of the endogenous variable without exogenous variables while the numerator shows the sum of squared errors of the fitted model. Hence, the ratio clearly shows improvement in the prediction power of the model due to exogenous variables. Third, R-squared can also be determined as the square of the correlation between the predicted and actual values of the model. Hence, High Square is not only indicative of the good explanatory power but also strong predictive power of a model. The F-statistics and Wald Chi-squared show that all the models are statistically significant that is the effect of all the exogenous variables excluding the intercept on the dependent variable is statistically significant. All the fixed effects controlling for the importing and exporting countries are statistically significant implying that ignoring these effects would lead to biased estimates. However, the year fixed effects are statistically significant 20 times out of 27.

The effect of distance on trade is assumed to be negative while common border, Preferential Trade agreement (PTA) and General System of Trade Preferences (GSP) is supposed to have a positive effect on trade. The estimated results show that the effect of distance on the trade of all the commodities is negative and statistically significant. The marginal effect (that is elasticity's) of distance on trade estimated using Poisson is consistently higher as compared to the elasticity's estimated using OLS. Elasticity's are higher for crude seed oil as compared to others. The effect of the common border on crude seed oil is consistently positive and statistically significant while it does not affect refined seed oil trade. Similarly, the effect of PTAs on the trade of all the three commodities is positive and statistically significant. In the case of PTA, out of the 36 estimated parameters (tables 2 to 10) only seven have a statistically insignificant effect on trade. However, the effect of PTA estimated using Poisson is much smaller than those estimated using OLS. The effect of GSP on trade is predominantly statistically insignificant. However, its effect is positive whenever it is statistically significant.

A tariff is an important determinant of crude seed oil trade only. Its effect is negative and statistically significant. Its elasticity estimated using Poisson is highly elastic as compared to the elasticities estimated using OLS. This is the first evidence of its kind of the effect of the tariff on crude oil trade. Poisson estimates show that, on average, a 10 percent increase in tariff reduces crude oil trade by about 25 percent, keeping other variables constant while the same effect estimated using OLS is about 14 percent. When commodities are aggregated to four-digit that is cottonseed oil, the effect tariff on trade fades away as none of the parameters of simple average tariff is statistically significant.

Seed account for two-thirds of the cottonseed that both cotton bolls, seed, and lint. There could be physical barriers to the utilization of seed because of a chemical tetraploidy, largely available in the crude oil. The other is that cottonseed could deteriorate due to non-availability of storage to keep the seed cool and dry and stop degradation (Gregory et al., 1999). While there are MRL standards for crude oil but countries and especially the EU do not specify these standards for processed products like crude oils. In such a situation when MRL is not defined for a processed food product, then the upper limit of MRLs is set equal to the MRL of raw product in this case cottonseed. The concentration of the product during the refining process is also considered in the MRL determination. Hence, the allowable bandwidths of MRLs in cottonseed vary according to the chemical nature of the pesticides and the oil contents. If a pesticide is highly soluble in fat or difficult to be eliminated during the primary extraction process, then MRL is determined by multiplying the seed MRL with concentration factor. Pesticides might also be solvable in water or fat or both. The bottom line is that untraceable traces of chemicals might exist in cottonseeds, and concentration during initial processing would lead to its detection in the crude oil. Hence, MRL standards are typically set higher in cottonseed, followed by crude and refined oil to protect human health.

Results compiled in table 11 show that the effect of MRLs on cottonseed is more prominent. However, it also gets all the pesticide sprayed on cotton plant and has the highest potential to absorb these. MRLs measured using Heterogeneous Index (HI) and Actual Heterogeneous Index (AHI) has a significant effect on crude cottonseed oil trade. The heterogeneity index of trade (HIT) of NTMs by Rau et al. (2010) is binary and measures the dissimilarity of NTMs of importing and exporting countries. However, countries could be dissimilar or otherwise in the stringency of the regulatory environment. In such a case, the effect of HI could be more intense. These effects are primarily inelastic except the marginal effect estimated using OLS for AHI which is highly elastic (–6.989). The AHI also shows a statistically significant effect of MRLs on cottonseed trade, though its effect is smaller than those estimated with HI. The effect of MRLs on crude oil trade is statistically insignificant for all the indices and estimation procedure. In the case of refined cottonseed oil trade, the effect of MRLs on trade is statistically significant for one-third of the cases. In the refined oil case, both the Li and Beghin and HI indices show a statistically significant effect of MRLs on refined cottonseed oil. Finally, the overall effect of MRLs on cottonseed oil is statically significant as presented in tables 8 to 10. These tables consistently show a statistically significant and negative effect of MRLs on trade. Irrespective of the measure, MRLs have a statistically significant negative effect on cottonseed and refine cottonseed oil. Since none of the measures of MRLs is perfect, therefore, if even one index shows a statistically significant negative effect on trade, then one can argue about the stringency of NTMs. Poisson uses more observations as compared to log-linearized OLS regression and hence produces statistically significant estimates.

Fixed effects are added to the estimated models to control for any heterogeneity stemming from differences between trading partners due to the factors other than those controlled in the model. However, such analysis fails to explain as what happens to trade between the pair of countries having similar as compared to different development levels. Developed (Northern) countries are considered rich and export manufactured goods and services while developing (Southern) countries are considered poor and export primary commodities in the form of food, minerals, and raw materials. The production process is generally shifted from north to south for reducing the cost of production for their products in the international markets. Standards such as MRLs emerged in the North. Irrespective of the initial effects of standards, these increased trade among northern countries once their harmonization took place (Chen and Mattoo, 2008). However, MRL standards are more stringent in North and are considered as a stumbling block to North-South integration as south does not have the technology to attain and maintain these standards (Otsuki et al., 2001). But on the positive side, the adoption of Northern standards, the southern partner countries can get an indirect benefit by improving goods quality, production techniques and product management (Begins and Maertens 2015). However, such improvements do not come without a cost and higher cost also changes market price and thus has the potential to change the direction of trade.

The cost of standards also differs by export destination. The idiosyncratic nature of standard in the north and the adaptation of these standards by the southern partners may cost higher than other markets. If a southern trade partner adopts a standard for accessing the European Union market, but it does not guarantee access to the United States market, the cost for the southern exporting country increases. This effect of the standards may be reduced by adopting the international standard of the codex. Wilson and Otsuki (2004) suggest that countries should adopt international standards as these are cost-efficient and provide access to a wider range of export destinations. Otsuki et al., (2001) empirically show that international standards are less trade impeding than the domestic ones.

4. Conclusions and Recommendations

This study was primarily conducted to estimate the effect of both tariff and non-tariff barriers on global cotton and its selected products trade. All the estimated models were statistically significant and the estimated parameters of gravity type variables such as distance, common border, PTAs, etc. are according to prior expectations. The elasticity estimated by using the Poisson technique is highly elastic as compared to the elasticities yielded by OLS. Cottonseed crude oil is the important commodity affected by tariffs especially trade among north-north and north-south countries. The effect of tariffs on cottonseed refines oil trade is statistically insignificant. MRLs have both positive and negative effect on trade. The effect of MRLs measured through Li and Beghin index and Poisson technique produced positive and statistically significant results, while it has negative effects on trade when measured through AHI and OLS method. In the first case, the same effect estimated using OLS is statistically insignificant while in the second case the effect estimated using Poisson is statistically insignificant. Hence, the estimated results are inconsistent across the estimation procedure even for the same measure of MRL. This implies that the analysis does not provide conclusive evidence. The effect of MRLs on crude oil trade is statistically insignificant for all the indices and estimation procedures, while it is statistically significant for one-third of the cases of refined cottonseed oil trade. Both the Li and Beghin and HI indices show statistically significant effects of MRLs on refined cottonseed oil. The overall effect of MRLs, when both crude and refined oil trade observations are aggregated to four-digit level, is statically significant. Irrespective of the measure, MRLs have a statistically significant negative effect on refine cottonseed oil. Since none of the measures of MRLs is perfect, therefore, if even one index shows a statistically significant negative effect on trade, then one can argue about the stringency of NTMs. In the case of cottonseed, crude oil MRL standards are trade enhancing among North-South regional trade but in the case of refined oil, the same effect becomes statistically insignificant. Trade restricting effects are observed when the South region is involved in the trade.

There is a great need for uniformity and harmonization of MRL standards. The standard of the effect of MRLs on human health must be established uniformly for all countries. This will reduce ambiguity and conformity. The existing harmonization of standards has been making standards more stringent contrary to the objective of harmonization. This stringency is evident in the North-South trade in this study. One of the ways to decrease ambiguity in standards is to make it mandatory for all countries to adopt the international standards of the Codex Alimentarius committee rather developing their own. The analysis presented in this study ignored how trade is effected when a country switches from one regime of MRL standard to another. The study recommends that such a study be conducted in order to highlight the effect of regime change in trade standards and to show whether the incremental effect of increasing or decreasing the stringency of trade standards has been increased.

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Appendices

TABLE 1: OLS AND POISSON ESTIMATES OF THE EFFECT OF TARIFF AND MRLS MEASURED USING PARTNER LI AND BEGHIN INDEX OF TRADE FOR CRUDE COTTON SEED OIL

Variables	Poisson	Marginal	OLS Estimates

	Estimates	Effects	(Logarithm)
Distance	-0.000***	-3.542***	-0.515
	(0.000)	(0.987)	(0.447)
Common Border	-0.277	-0.045	0.866
	(0.624)	(0.101)	(0.602)
Partner Simple Average Tariff	-0.266***	-2.338***	-0.142***
	(0.052)	(0.457)	(0.037)
Li and Beghin Index as a Measure of MRLs	-0.548	-0.398	0.713
	(0.722)	(0.524)	(0.578)
Preferential Trade Agreements	3.945***	1.449***	1.680
	(1.079)	(0.397)	(1.475)
Generalized System Preferences	0.189	0.012	-3.961*
	(1.666)	(0.104)	(1.526)
Real Per Capita Income of Reporting country	2831.214	0.539	-2.511
	(603.124)	(0.115)	(4.595)
Constant	-5.111**		-52.205
	(1.835)		(87.709)
Fixed Effects			
Partner Country	1290.500****	---	3.610***
Reporting Country	402.500***	----	14.210***
Years	141.890***	----	2.670**
Summary Statistics			
Number of Observations	1,226	1,226	327
Wald chi-square	7028.310***	----	----
Pseudo R-squared	0.556	----	----
F-statistics	----	----	.
R-squared	----	----	0.666
RMSE	----	----	2.166

Robust standard errors are given in parentheses. ***, ** and * show significance at 99, 95 and 90 level of significance.

TABLE 2: OLS AND POISSON ESTIMATES OF THE EFFECT OF TARIFF AND MRLS MEASURED USING PARTNER LI AND BEGHIN INDEX OF TRADE FOR REFINE COTTON SEED OIL

Variables	Poisson Estimates	Marginal Effects	OLS Estimates (Logarithm)
Distance	-0.000***	-1.211***	-1.050***
	(0.000)	(0.323)	(0.149)
Common Border	2.763***	0.231***	0.253
	(0.537)	(0.045)	(0.359)
Partner Simple Average Tariff	-0.0383	-0.325	-0.004
	(0.032)	(0.271)	(0.022)
Li and Beghin Index as a Measure of MRLs	-0.977*	-0.723*	-0.376
	(0.397)	(0.294)	(0.319)
Preferential Trade Agreements	2.528***	0.626***	-0.316
	(0.829)	(0.205)	(0.398)
Generalized System Preferences	0.066	0.007	0.025
	(0.521)	(0.062)	(0.525)
Real Per Capita Income of Reporting country	-974.501	-0.659	-5.544**
	(849.585)	(0.144)	(2.743)
Constant	-4.476***		-104.067
	(0.885)		(52.222)
Fixed Effects			
Partner Country	5711.12****	---	14.360***
Reporting Country	2325.610***	----	11.88***
Years	30.510***	----	0.95

Summary Statistics			
Number of Observations	3546	3546	1199
Wald chi-square	15197.670***	----	----
Pseudo R-squared	0.514	----	----
F-statistics	----	----	.
R-squared	----	----	0.563
RMSE	----	----	2.444

Robust standard errors are given in parentheses. ***, ** and * show significance at 99, 95 and 90 level of significance.

Table 3: OLS and Poisson estimates of the effect of tariff and MRLs measured using Partner Li and Beghin Index of Trade for Cotton Seed Oil

Variables	Poisson Estimates	Marginal Effects	OLS Estimates (Logarithm)
Distance	-0.000***	-1.814***	-1.358***
	(0.000)	(0.156)	(0.075)
Common Border	1.693***	0.937***	1.848***
	(0.109)	(0.006)	(0.165)
Partner Simple Average Tariff	-0.010	-0.086	0.001
	(0.017)	(0.146)	(0.012)
Li and Beghin Index as a Measure of MRLs	0.316*	0.245*	0.017
	(0.181)	(0.141)	(0.159)
Preferential Trade Agreements	1.585***	0.319***	0.319***
	(0.177)	(0.036)	(0.144)
Generalized System Preferences	-0.473	-0.069	0.644
	(0.330)	(0.048)	(0.262)
Real Per Capita Income of Reporting country	291.051	0.057	0.312
	(202.637)	(0.039)	(0.922)
Constant	-2.728***		-4.455*
	(0..312)		(2.608)
Fixed Effects			
Partner Country	4011.230****	----	131.220***
Reporting Country	4065.210***	----	36.000***
Years	33.530***	----	3.140**
Summary Statistics			
Number of Observations	9,729	----	5,296
Wald chi-square	11315.790***	----	----
Pseudo R-squared	0.568	----	----
F-statistics	----	----	.
R-squared	----	----	0.581
RMSE	----	----	2.553

Robust standard errors are given in parentheses. ***, ** and * show significance at 99, 95 and 90 level of significance.

Table 4: The effect of Tariff and non-tariff barriers on cotton and its selected products estimated using OLS and Poisson estimates for North-North, North-South, and South-South trade

Variables	Trade Direction	Poisson Estimates	Marginal Effects	OLS Estimates (Log)
Cotton seed crude oil (151221)				
Partner Simple Average Tariff	NN	-0.259***	-2.324***	-0.113***
		(0.053)	(0.471)	(0.038)
	NS	-2.245***	-16.605***	-0.234
		(0.498)	(3.689)	
	SS	----	----	----

Variables	Trade Direction	Poisson Estimates	Marginal Effects	OLS Estimates (Log)
Li and Beghin Index	NN	-0.555	-0.421	0.786
		(0.779)	(0.590)	(0.561)
	NS	8.791***	4.351***	-6.757
		(1.494)	(0.739)	
	SS	----	----	----
Cotton seed refined oil (151229)				
Partner Simple Average Tariff	NN	-0.043	-0.375	-0.007
		(0.032)	(0.287)	(0.024)
	NS	0.165	1.231	-0.116***
		(0.106)	(0.790)	(0.055)
	SS	-3.615***	----	----
		(0.212)		
Li and Beghin Index	NN	-1.045**	-0.819	-0.492
		(0.408)	(0.320)	(0.342)
	NS	-0.913	-0.524	0.364
		(1.228)	(.705)	(1.24)
	SS	2.64**	----	----
		(1.569)		
Cotton seed oil (1512)				
Partner Simple Average Tariff	NN	-0.0156	-0.142	-0.003
		(0.016)	(0.147)	(0.013)
	NS	-0.092	-0.679**	0.013
		(0.047)	(0.344)	(0.026)
	SS	0.046	0.254	-0.055
		(0.06)	(0.363)	(0.145)
Li and Beghin Index	NN	0.705***	0.583***	0.215
		(0.227)	(0.187)	(0.201)
	NS	0.864***	0.573***	-0.107
		(0.227)	(0.151)	(0.284)
	SS	0.376	0.162	1.531
		(1.098)	(0.473)	(1.529)

Robust standard errors are given in parentheses. ***, ** and * show significance at 99, 95 and 90 level of significance.