Impact of non-tariff barriers on Indian exports: An econometric analysis

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Abstract

With the formation of World Trade Organization and subsequent liberalization in global trade, the non-tariff barriers (NTBs) have started to play a pivotal role in exports, especially from developing countries. In this context, the current study attempts to find out the impact of non-tariff barriers on Indian exports. Panel data regression method and factor analysis were used to find out the impact of non-tariff barriers. Panel data had a time series component of 12 years (2001-2012) and cross section component of three countries for various parameters. The study identified that a 1% increase in number of export consignment rejections, on average, leads to 0.12% decline in value of Indian exports. On analyzing the Operational and Administrative System for Import Support (OASIS) data by U.S. Food and Drug Administration, it was found that rate of rejection of food products was very high compared to other categories like cosmetics, drugs, antibiotics etc. Proper awareness regarding quality parameters among the producers as well as harmonization of technical and food safety standards will help to solve the problem to a great extent.

Keywords: Non-tariff barriers, OASIS, Panel data regression

Introduction

Trade barriers are generally understood as government imposed restrictions on international trade. Trade barriers can be broadly categorized into two namely, tariff and non-tariff barriers to trade. These measures are widely adopted by the nations around the globe to distort trade and its efficiency. However, trade barriers are usually condemned for their negative effect on developing world.

Non-tariff measures are those, other than normal tariffs, that have the effect of restricting trade between nations. Prominence of NTBs has increased after the abolition of quotas or a significant reduction in tariffs due to continued intervention of WTO after 1995. Hence it is not surprising that the developed countries with relatively lower tariffs are more prolific users of NTMs/NTBs especially to keep out low cost products from developing countries. For example,

in order to export food products to USA, detailed labeling requirements are essential with extensive product and content description. Also, export of paper products to USA needs non-scientific quarantine restrictions, custom surcharges, eco-labelling requirements and compliance with SPS standards. NTBs include import bans, unjustified SPS measures, employment law, unreasonable packing, labeling and other requirements, additional trade requirements like certificate of origin, certificate of authenticity etc. Hence, non-tariff measures are directly or indirectly influencing trade especially those from developing world.

The Sanitary and Phyto-sanitary (SPS) requirements are more recent NTBs and are increasingly being applied to the production and trade of agricultural products. Farmers have the most difficulty in complying with the issues related to pesticides. For some products, the combination of Maximum Residue Level (MRL) regulations and Moroccan

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pesticide regulations impede trade preventing both producers and traders from entering certain promising export markets (Aloui and Kenny, 2005). The aforesaid issue is especially relevant in context of developing countries and thereupon India.

Indian commodities are increasingly being rejected nowadays in the international market due to non-compliance with stringent regulatory standards. Shinoj et al. (2009) concluded that there had been innumerable instances of Indian fishery consignments being rejected by USA, EU and Japan. This study attempts to analyze the effect of non-tariff barriers on export of commodities from India.

Materials and Methods

Creation of WTO could have made a great impact on international trade since it focused on removing existing trade restrictions. Since formation of WTO in 1995 created a paradigm shift in international free trade regime, it was presumed that a dummy variable would capture the structural break post 1995. Hence, dummy variable technique/indicator variable technique was used to find out the presence of structural breaks in total Indian export data (1988-2012). Data for major trading partners of India like USA, EU, Japan, Middle East and Russia were analyzed using the above technique. The model used for estimation is given below.

$$Y_i = \alpha + \beta_1 D_t + \beta_2 t + u_t \quad (1)$$

Where,

Y_i = export of all commodities in value terms (nominal) from ith country for the time period 1988-2012

t = time variable

D_t = dummy variable having value 1 for observations in 1996-2012

= 0 for observations in 1988-1995

The gravity model of bilateral trade postulates that the volume of trade between two countries is proportional to their gross domestic products (GDP)

and inversely related to trade barriers between them (Fadeyi et al., 2014). The current study has adopted basic gravity model with some modifications relevant for the context. Impact of non-tariff barriers to trade was analyzed using panel data regression method and factor analysis.

The model used for the study is explained below.

$$X_i = f(Rej_i, Percap_i, Imp_i, Exchrate_i, Dist_i)$$

Where,

X_i = Indian exports in million USD to different importing countries

Rej_i = number of Indian consignments rejected by importing countries

$Percap_i$ = per capita income of importing countries in USD

Imp_i = total import of all commodities by importing countries in million USD

$Exchrate_i$ = nominal exchange rate

$Dist_i$ = distance between ports of importing countries and Mumbai port in nautical miles.

The equation considered in this study can be written as follows.

$$\ln X_{it} = \alpha + \beta_1 \ln Rej_{it} + \beta_2 \ln Percap_{it} + \beta_3 \ln Imp_{it} + \beta_4 \ln Exchrate_{it} + \beta_5 \ln Dist_i + \varepsilon_{it} \quad (2)$$

Where,

$\ln X_i$ = log of exports of commodities from India to ith importing country during year t

$\ln Rej_{it}$ = log of number of Indian consignments rejected by ith importing country in the year t

$\ln Percap_{it}$ = log of per capita income of ith importing country during year t

$\ln Imp_{it}$ = log of total import of ith importing country during year t

$\ln Exchrate_{it}$ = log of exchange rate of currency of ith importing country during year t

$\ln Dist_{it}$ = log of distance between a port of ith importing country and Mumbai port

α = intercept term

$\beta_1, \beta_2, \ldots, \beta_5$ are coefficients of explanatory variables

ε represents unexplained error term. Here we assume that $\varepsilon_{it} = \mu_i + e_{it} \quad (3)$

To analyze the model, only demand side factors are considered. The panel data has time series component of 12 years (2001 -2012) and cross section component of 3 countries/groups (USA, EU and Japan). The above 3 countries were selected purposively due to availability of accurate data on rejection of export consignments. Panel data regression can be estimated using several techniques; the most common are Ordinary Least Squares, Fixed Effects Model and Random Effect Model. So, the model given in equation 2 and 3 is estimated by (i) Ordinary Least Squares (OLS) (ii) Least squares with dummy variables (μ being fixed) or Fixed Effects Model and (iii) assuming μ as random i.e Random Effects Model.

After obtaining estimates from above mentioned three types of models, the next step is to select the appropriate model. Therefore, the choice was among: (a) OLS (b) Fixed Effect (c) Random Effect model. Two tests were used for selection of appropriate model, namely: 1) Hausman test which help us to distinguish between random effects model and fixed effects model 2) Breusch –Pagan Lagrange Multiplier Test which shows the better model between Random and OLS.

Results of above panel data regression can be substantiated using factor analysis. It is a data reduction technique. It is applied in the environment where n numbers of factors or forces directly/ indirectly interacts and affect the occurrence of a phenomenon/ event. The factor analysis technique provides a means of identifying and measuring the relationships or basic patterns in the data set (Murthy et al.,1990). Total Indian exports, per capita income of importing countries, exchange rate (USD, Euro and Japanese Yen), import refusal data and total imports by 3 selected countries were used for factor analysis.

Tabular analysis is done to examine the extent of rejections in Indian food consignments by USA for which data has been obtained from OASIS, USFDA.

Variables and data
Indian exports, expressed in million dollars, to selected importing countries were obtained from UNCOMTRADE data for years 2001-2012 which was the dependent variable.

Number of Indian consignments rejected by selected importing countries was used to capture impact of non-tariff barriers to trade. It was assumed that above variable would act as a proxy for capturing the effect of non-tariff barriers to total Indian trade. There are several grounds for rejection of Indian consignments by trading partners like non-compliance with SPS standards, mislabeling, improper packaging, misbranding etc. As the number of rejections increases, it becomes more and more difficult for Indian exports to reach export markets which in a way show the impact of non-tariff barriers to trade. Import refusal report by USA was obtained from OASIS (Operational and Administrative System for Import Support) which is managed by US Food and Drug Administration. Similar data for European Union were obtained from RASFF (Rapid Alert System for Food and Feed) reports for years 2001-12. Data for Japan's rejection of Indian consignments were taken from website of Ministry of Health, Labour and Welfare, Japan.

Per capita income of different importing countries was included in the model to show demand potential of importing countries. As per capita income increases, aggregate demand increases. Statistics on Gross National Income (GNI) per capita in US$ were taken from World Bank. Market potential of importing countries could be captured by total import of all commodities by selected countries, the data for which were obtained from UNCOMTRADE. Exchange rate was also included in the model to capture effects of currency fluctuation. Theoretically, as domestic currency depreciates, domestic export increases. Rationale behind considering nautical distance between Indian port and foreign port is that it can impede trade. Sea-distances.org provided the required data on

nautical distance. JNPT (Jawahar Lal Nehru Port Trust), Navi Mumbai was selected purposively for the current study, since it handles more than 50% of country's containerized cargo trade.

Results and Discussion

Prominence of non-tariff barriers (NTBs) to trade has increased after the reduction of tariff barriers. Many studies have already shown that developed countries are using these measures as a means to impede trade from developing countries. Maskus and John (2001) suggested that the application of product regulations and standards is becoming increasingly contentious as an implicit non-tariff barrier to trade.

World Trade Organization (WTO) was formed in 1995, which succeeded General Agreement on Tariffs & Trade (GATT), and plays a very important role in supervising and liberalizing international trade. WTO's agreements, negotiated and signed by a large majority of the world's trading nations, are ratified in their parliaments. These agreements are the legal ground-rules for international commerce. Essentially, they are contracts, guaranteeing member countries important trade rights. They also bind governments to keep their trade policies within agreed limits to everybody's benefit (WTO, 2014). Formation of WTO has helped many less developed and developing countries in participating and getting benefitted from international trade. The countries undertaking substantial reforms in the context of WTO accession were found to grow 2.5

per cent faster for several years thereafter (WTO, 2014).

The results in Table 1 prove that the export of Indian commodities to the world showed a structural break after 1995 which is also the formative year of WTO. Indian export to her major trading partners showed a structural break after 1995 (indicated by significant dummy variable) except Russia. Results show that Indian exports to Russia had not experienced a major change in 1995. This could be due to the fact that Russia was not a member of WTO in 1995 (Russia joined WTO only in 2012). In WTO regime, each member country is supposed to open up its economy and participate in international trade. WTO administers implementation of Agreement on Technical Barriers to Trade (TBT) and Agreement on application of Sanitary and Phytosanitary (SPS) measures which together constitute core of modern NTBs. WTO's agreements (which include tariff and non-tariff barriers), negotiated and ratified by many countries all over the globe, might have influenced exports of commodities from the country.

Non-tariff barriers are a part of WTO agreements which play a paramount role in deciding direction of exports. This study tried to analyze impact of NTBs on Indian trade using regression analysis, the results of which are shown in Table 2.

Four regressions were run in each model with different combinations of explanatory variables. In the first regression, number of rejections and per

Table 1. Results of dummy variable technique to find out the presence of structural break in 1995

Indian exports to different countries	Independent variablecoefficient (1988-2012)	Dummy =1 for 1996-2012= 0 for 1988-1995	R^2
All	15598.7(0.000)*	-97711.21(0.001)*	0.8493
USA	1589.774(0.000)*	-7338.8(0.008)*	0.8875
UAE	2093.241(0.000)*	-14321.54(0.001)*	0.8119
UK	433.63(0.000)*	-2307.46(0.001)*	0.9108
Japan	250.6(0.000)*	-2036.2(0.001)*	0.7574
China	1031.5(0.000)*	-6503.7(0.001)*	0.8447
Russia	62.3(0.001)*	-430.41(0.70)	0.4996

Parentheses show exact level of significance. * indicates p value less than 5%.

Table 2. Results of Panel Data Regression showing the impact of NTBs on Indian Exports

Model	Rej data	ExchangeRate	Per Capita Income	Total Imports	Distance	Constant
		Explanatory Variables				
OLS	-0.8543	0.529	3.676			-25.42
	(0.000)*	(0.217)	(0.000)*	————		(0.000)*
	-0.127	0.609		1.451		-12.43
	(0.000)*	(0.001)*	————	(0.000)*		(0.000)*
	-0.250	2.99			2.136	-19.511
	(0.000)*	(0.000)*	————	————	(0.000)*	(0.000)*
	-0.6633	0.646	-0.3222	1.556		-11.077
	(0.361)	(0.000)*	(0.382)	(0.000)*	————	(0.000)*
RE Model	-0.8543	0.529	3.676			-25.42
	(0.000)*	(0.217)	(0.000)*	————		(0.000)*
	-0.127	0.609		1.451		-12.43
	(0.000)*	(0.001)*	————	(0.000)*		(0.000)*
	-0.250	2.99			2.136	-19.511
	(0.000)*	(0.000)*	————	————	(0.000)*	(0.000)*
	-0.6633	0.646	-0.3222	1.556		-11.077
	(0.361)	(0.000)*	(0.382)	(0.000)*	————	(0.000)*
FE Model	0.1731	0.686	1.951			-15.08
	(0.215)	(0.049)*	(0.000)*	————		(0.000)*
	0.181	0.504		1.233		-11.140
	(0.017)*	(0.012)*	————	(0.000)*		(0.000)*
	0.645	1.749				-2.01
	(0.000)*	(0.000)*	————	————	dropped	(0.153)
	0.1630	0.472	0.173	1.171		-11.846
	(0.053)	(0.025)*	(0.593)	(0.000)*	————	(0.000)*

Dependent Variable: Indian exports to different countries

Parentheses show exact level of significance. * indicates p value less than 5%.

capita income were shown to be significantly influencing the Indian exports. Exchange rate was not shown to be significant. As per capita income of importing countries increases, exports to those countries also increase. In the second regression, number of export rejections, exchange rate and total import of importing countries were shown to be significantly influencing the Indian exports. Results show that 1% increase in export rejections, on average, will lead to a 0.12% decline in total export value to these countries. The results also conform to the theory that depreciation of rupee will have a significant and positive impact on exports. Total import of developed countries shows the market potential available in those countries which also have a positive impact on Indian exports (a 1% increase in total imports, on average, leads to a 1.4% increase in Indian exports). A third regression was run with inclusion of distance as an explanatory variable with exchange rate and import refusal as other explanatory variables. Results had shown a positive relationship between value of exports and distance. But the results are in contradiction with the theory which says that as distance increases, exports decline due to higher transportation cost. Hence third regression was eliminated at the first stage itself. Fourth regression model contains rejection rate, exchange rate, per capita income and total import by importing countries as explanatory variables. Here, exchange rate and total imports were the only significant variables. Per capita income and number of rejections were not significant – it is not having an impact on export value. When OLS estimation methods were used, import refusal was highly significant in all three regressions except one. This shows that number of consignments rejected by importing countries which was used as a proxy to capture impact of non-tariff

barriers affect exports significantly. As expected, coefficient of proxy variable shows a negative sign i.e., a negative relationship between exports and non-tariff barriers.

In random effect model, variations across entities are assumed to be random and uncorrelated with independent variables in the model. Here time invariant variables like distance can be included. In fixed effects model time invariant variables are absorbed by intercept term. Results obtained after running regression were found to be similar for both random effects model and OLS model.

Fixed effects model explores relationship between dependent and explanatory variables and this model removes the effect of those time invariant characteristics from explanatory variables. In first regression, exchange rate and per capita income are said to have significant impact on export value. Here non-tariff barrier is found to be insignificant. Exchange rate, import refusals and total imports have a positive as well as significant influence on Indian export value, as per the second regression.

Hausman test, which was performed to choose the most suitable model among the three, favoured fixed effects model but this model had a contradiction with theory. So fixed effects model was eliminated

at this stage. Results obtained from OLS and random effects model were same due to the absence of panel effect. The results from OLS and random effects model also conforms to economic theory. Due to the aforesaid reasons it was decided to adopt random effects model.

Factor analysis was also performed to ascertain components governing export of total commodities from India. Results are shown in Table 3. Results of factor analysis substantiate results obtained from panel data regression – OLS and Random effects model. Exports of Indian commodities are having a strong correlation with total import of all commodities by these countries. Number of Indian export consignments rejected by importing countries has a negative correlation with export value as expected. Exchange rate also has moderate influence on export value from India. Per capita income of importing countries does not play a significant role in improving earnings from exports as depicted in panel analysis. In the final model, it was decided to include exchange rate, number of consignments rejected by importers and total import by selected importing countries as influencing variables which was confirmed by panel data analysis and factor analysis. That is, a 1% increase in number of consignment rejections by importers, on average, will lead to 0.12% decline in value of

Table 3. Results of Factor Analysis Technique showing the factors affecting Indian exports*

Factor analysis/correlation			Number of obs = 36	
Method: principal factors			Retained factors = 3	
Rotation: orthogonal varimax (Kaiser off)			Number of params = 10	
Factor	Variance	Difference	Propoortion	Cumulative
Factor 1	2.49	0.86	0.56	0.56
Factor 2	1.63	1.30	0.37	0.93
Factor 3	0.32		0.07	1.00
LR test: independent vs. saturated: chi2(10) = 251.04 Prob>chi2 = 0.0000				
Rotated factor loadings (pattern matrix) and unique variances				
Variable	Factor 1	Factor 2	Factor 3	Uniqueness
Xi	0.9630	-0.1394	0.2095	0.0094
Impi	0.9922	0.0408	0.0622	0.0100
rejdata	-0.5260	0.8158	-0.1512	0.0349
Percapi	0.1646	0.9575	-0.0094	0.0560
exchrate	0.5325	-0.1829	0.5084	0.4246

*The result was obtained by running factor analysis using 'stata' software statistical package and presented in tabular form

Table 4. Import refusal Report by USA for Indian consignments in the year 2013

Month	Total number of rejections	Number of food product rejections	Number of rejections in spice exports
January	238	171	41
February	249	207	71
March	162	95	28
April	274	162	62
May	152	112	37
June	142	78	27
July	163	115	23
August	159	92	21
September	119	63	28
October	136	73	17
November	233	102	56
December	118	73	27
Total	2152	1343	438
		(62.4)	(20.3)

Figure in parenthesis indicate the percentage with respect to total number of rejections (Source: Derived from OASIS, USFDA)

exports. Similarly, a 1% increase in exchange rate, on average, will lead to 0.6% increase in value of exports. Also, a 1% increase in total import by importers, on average, will lead to 1.4% increase in value of exports from the country.

Agricultural exports are affected by imposition of TBTs and SPS by the developed countries. Food safety standards imposed by the developed countries could impede processed food exports from developing countries. This could emerge because practically SPS is less transparent than tariffs or quotas (Jongwanich, 2009).

On analyzing OASIS data which provides the import refusal report for USA (presented in Table 4), it was found that the rate of rejection of food products were very high compared to other categories like cosmetics, drugs, medical equipment, antibiotics etc. In the year 2013 alone, around 62% of total consignments rejected were that of food products. Reasons cited for food rejections were adulteration, filthy food, presence of fungus like *Salmonella*, high content of aflatoxin etc. Mislabeling, improper packaging etc were also stated as reasons for rejection. This emphasizes the fact that compliance with SPS standards is very important for food products. Drugs, cosmetics and medical equipment consignments were also

rejected. Misbranding, absence of approval certificate etc were the major reasons for rejections in those cases.

India has been famous for spice trade from ancient times and they constitute a higher proportion in the export of food products. Table 4 shows the extent of rejection of spice products among the agricultural commodities. Spice products constitute 32% and 20% of food product rejections and total number of rejections respectively.

Each and every country in the world now demands quality food products. The technical regulation that they impose on domestically produced goods for health and consumer protection will naturally conform to the imported goods also. These technical regulations are meant to protect life from food-borne infections and also plant carried infections. These measures adopted by different countries can affect the pattern of trade by reducing them or banning them. SPS measures are one among the major non-tariff barriers (NTBs) to trade. The SPS measures will also add to the cost of exporting firms because meeting quality standards imposed by the importing countries will definitely raise the cost of processing and production. However, developing countries should view SPS not just as a trade barrier but also as an opportunity to upgrade quality standard and

market sophistication (Jongwanich, 2009).

Study attempted to find out how the NTBs are affecting the Indian competitiveness in world export market and the results show that non-tariff barriers play an important role in Indian exports. This study could identify the impact of non-tariff barriers to trade on export value. A 1% increase in number of export consignments rejected, on average, will lead to a 0.12% decline in value of Indian exports. As standards become more stringent, it will become difficult for the Indian exporters to comply with those standards and may lead to rejections. In a way, import refusal data could capture impact of non-tariff barriers to trade. Market size and exchange rate were identified as other important variables which determine the export value. Increased market size will improve exports from India to a great extent. Also, an increase in exchange rate, generally will lead to depreciation which will be favourable to exporters and promote exports from the country. Awareness regarding quality parameters are highly needed up to the bottom level in case of developing countries because dissemination of information is still a predicament for us. Harmonization of technical standards must be highly encouraged among the major exporting and importing nations so that these measures will not be and cannot be used a trade barrier.

Globalization has become the face of 21st century and now it is impossible to fully contain its effect. With increased integration of economies, the trading nations will try to impose superior standards on each other which may affect our trade in short-term. India needs a three-fold strategy to overcome this. Enhancing the domestic level food quality and labeling standards, harmonization of technical standards and creating awareness regarding quality parameters are the way forward.

Acknowledgement

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