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International Food Safety Standards and India's Food Exports

An Analysis Based on Gravity Model Using Three-Dimensional Data

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Discussion Paper # 169

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International Food Safety Standards and India's Food Exports
An Analysis Based on Gravity Model Using Three-Dimensional Data[*]

Rajesh Mehta[**]

Abstract: The paper tries to understand precisely how the food safety regulations applied by the industrialized countries have an effect on India's export of processed food to these markets. It also examines the information deficiencies of Indian firms about international food safety standards, which influence their current performance. In the light of these objectives the paper tests a few hypotheses using primary data. This has been carried out by estimating gravity model using three-dimensional statistics. Our results show that India stood to loose around 156 per cent of actual exports because of higher stringent food safe regulations in select developed countries. It also proves that foreign collaborators provide better information about the prevailing food safety regulations and how to meet those obligations.

Keywords: India's processed food export, international food safety standards, Gravity Model, fixed effects model, random effect model

The need to understand how food safety regulations imposed by the US, EU, Japan, and other developed countries affect India's exports of the processed food to these markets is the main object of this paper. As there is only limited empirical data available in this field, we use primary data through a survey of firms engaged in the processed food exports from India. A preliminary analysis of this sample data is given in Mehta, Nambiar and

Arockiasamy (2005). While the preliminary investigations certainly point to the alleged obstructive role of the International Food Safety Standards (IFSS, sometimes know as SPS Agreements of the WTO), the evidence is not sufficient to give a precise quantitative estimate of the deterrent effects of the food safety regulations on India's processed food exports. Similarly, we would also like to know how the information deficiencies of the firms about SPS affect their current performance, the link between IFSS compliance and export experience, foreign affiliation and size distribution of the firm. In what follows, we try to assess the precise nature of these links by testing the various hypotheses or where such testing is not feasible draw some inferences utilising the available data which would at least help to show the direction of causation. In the light of above mentioned objectives, we intend to test following three hypotheses:

• Processed food exports are impeded by the level of food safety standards in importing countries.

• Effect of inter-country differences in food safety standard is different on India's processed food exports.

• Current performance and potential of India's exports are influenced by factors such as information deficiencies.

1. India's Exports and International Food Safety Standards

In this section, we test the hypothesis:

Hypo : Processed food exports are impeded by the higher level of food safety standards in importing countries as compared to international (Codex[1]) standards.

To test this hypothesis, we draw on the gravity model. In traditional trade models, differences in factor endowments are posited to explain differences in trade patterns of countries. However, factor endowments have often failed to explain the observed trade patterns. Logically, it leads one to wonder whether other important factors that may be at work have been ignored in the traditional trade models. Consequently, economists began to visualize the 'gravity' model, a model that was for a long time perceived as having no theoretical foundation till Anderson (1979) gave it a theoretical foundation to offer the best explanatory power. Drawing on Newton's Law of Universal Gravitation from physics, these models postulate that trade flows between

any two countries are positively related to the size of their markets and inversely to the distance between them.[2]

Recent literature also suggests that the basic model can be expanded to increase its explanatory power by including a number of other variables that influence bilateral trade flows, such as land to capture the natural resources, population to capture economies of scale, etc. Winters and Soloaga (2001) observe that remoteness of a country measured by the average distance of the importer from its exporting partners weighted by exporters' GDP share in world GDP can capture the trade gravity. Srinivasan and Cononero (1993) used the gravity model to quantify the impact of tariff barriers on exports of some of the south Asian countries, including India.

Economists have over the past few years used gravity models to trace the impact of food safety standards and regulations on trade by regressing trade flows on a proxy for standards together with other factors that may affect trade flows. Swann (1996) regressed British imports, exports and net exports, and found that unilateral British standards have a positive effect on both, exports and imports. He concluded that shared standards between two trading countries tend to have little impact on imports but a positive effect on exports. Moenius (1999) found that unilateral standards tend to promote trade in manufacturing sectors, but hinder trade in non-manufacturing sectors such as agriculture. Otuski, Wilson and Sewadesh (2001) and Wilson and Otuski (2001) found that the restrictive European standards have a disruptive impact on trade.

In line with the above-cited studies, we utilize the gravity model to estimate the impact of food safety standards (FSS) on processed food exports from India. The four products identified for this purpose are: shrimps, egg powder, mango pulp and mushrooms. The adopted version of the gravity model considered for this study is:

$X = f(GDP_X, IMP_M, POP_X, POP_M, DIS, SPS)$

where
X represents the processed food export from India
GDP_X is the GDP (Gross Domestic Product) of India

IMP$_M$ is Import of the importing countries

POP$_X$ and *POP$_M$* are the population in India and the importing country, respectively.

DIS is the distance

SPS is an index of food safety standards (sanitary and phytosanitary measures), in importing countries.

Regression Analysis

It is sometimes argued that the Food Safety Regulations (or SPS measures) imposed by developed countries do not work as impediments to processed food exports from India. It implies that the coefficient of SPS in the above mentioned model is not significant. The equation considered in this study, using three-dimensional statistics can be written as:

$$lEXP_{ijt} = \alpha + \beta_1 lGDP_t + \beta_2 lIMP_{ijt} + \beta_3 DIS_j + \beta_4 lPOPI_t + \beta_5 lPOP_{jt} + \beta_6 SPS_{ijt} + \in_{ijt} \quad (1)$$

where

$lEXP_{ijt}$ = log of exports from India of i-th food processed product, to j-th importing country for t-th year

$lGDP_t$ = log of GDP$_t$ of India in year t

$lIMP_{ijt}$ = log of imports of the i-th food product in j-th importing country, during t-th year

DIS_j = distance between India (I) and the importing country (j)

$lPOPI_t$ = log of population in India during year t

$lPOP_{jt}$ = log of population in j-th importing country during year t

SPS_{ijt} = value of SPS index of i-th food product in j-th importing country during year t

(higher the index value, higher the standard)

α = intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are coefficients of the explanatory variables

$\in$ represents the unexplained error term.

Equation (1) is a three-dimensional panel consisting of four sample product lines, seven countries and a four-year period from 2000 to 2003.

i = 1,..,4 = Poultry (Egg powder), Fisheries (Shrimp), Mushroom and Mango Pulp

j = 1,2,....,7 = US, Japan, Australia, France, Germany, the Netherlands, the UK

t = 2000, 2001, 2002, 2003.

The panel data demands that random term ($\in$) should capture the characteristics of different food products, different countries and time periods. Since the sample information for time period is small and the commodities belong to similar group (processed food), we presume

$$\in_{ijt} = _j + e_{ijt} \qquad ....(2)$$

Finally the model given in equations (1) and (2) is estimated by: (i) Ordinary Least Squares (or OLS), (ii) Least squares with dummy variables (being fixed) or Fixed Effects Model, and (3) assuming as random i.e. Random Effects Model.

In the Random Effects Model, we have further assumed that

$$E(e_{ijt}) = 0, \; Var(_j) = \sigma^2, \; Var(e_{ijt}) = \sigma_e^2 \; \text{and} \; Cov(e_{ijt}, _j) = 0 \qquad .....(3)$$

The Random Effects Model is estimated by the Flexible Generalised Least Squares (GLS). Two steps procedure is used for estimation. In the first step, the variance components (σ^2 and σ_e^2) are estimated by using the residues from OLS. In the second step, the flexible GLS estimates are computed using estimated variances.

The Variables and the Data

GDP_t is taken in US dollars; and this variable is included to capture the supply potential from India. Population figures are taken from World Development Indicators. Import data of 7 importing countries, i.e. US, Japan, Australia, France, Germany, the Netherlands, and the UK, taken from the World Trade Atlas (WTA) captures the size of the markets in importing countries and is drawn for four-sample product lines defined at the 6-digit level of the Harmonized System (HS) of International Trade Classification (ITC). India's export data, reported in million US dollars is drawn from CMIE, India

Trades. Considering the changes in the HS Classification, matching of the four product lines was done at six digits HS trade classification (Table 1).

Table 1: Six-Digit HS Trade Classification Codes for Chosen Products

Commodity	HS 1996 (used for trade statistics sample years 2001 and 2002)	HS 2002 (used for trade of sample year 2003 and 2004)
Mango pulp	081290	081290 extension
Poultry (Egg Powder)	040700	040700
	040811	040811
	040819	040819
	040891	040891
	040899	040899
Mushroom	060291	060290
	070951	070951
		070959
	071230	071231
		071239
	200310	200310
		200390
Shrimp	030613	030613
	030623	030623
	160520	160520

Source: Mehta, Nambiar and Arockiasamy (2005).

The rationale behind considering the nautical distance between India and the processed food importing countries is that it can impede trade. Besides, nautical distance helps us to include the degree of spoilage/damage to exported good, country-wise. Thus, the nautical distances from Mumbai (India) to Osaka (Japan), Elizabeth (USA), Melbourne (Australia), Marseilles (France), Hamburg (Germany), Amsterdam (Netherlands), and Southampton (UK) are considered for this study, based on the data provided by the website www.distances.com.

The SPS variable is a weighted index constructed separately for each of the four products and the sample destination countries; and Codex standards for the base year (2000) are taken as benchmarks. Note that this weighted index helps us to estimate the severity or stringency of the imposed standards on Indian processed food exports. More details on the indexing methodology for SPS index are given in Mehta, Nambiar and Arockiasamy (2005), and Jayasuriya, MacLaren and Mehta (2005).

India exports the above-mentioned four sample product lines to many countries. However, the basic purpose of this exercise is to investigate whether the SPS measures work as impediments to processed food exports. Developed countries are the ones, which have rather strict SPS measures. Among the developed countries, the major export markets for processed food products from India are the US, Japan, Australia, France, Germany, the Netherlands, and the UK. Thus, in order to analyse and quantify the impact of SPS measures on processed food exports from India, these seven countries are considered.

Results

The estimation of regression equations (1) and (2) is carried out using 112 observations.[3] To capture the specific characteristics of different importing countries, we obtained three sets of estimates:

1. Classical Least Squares Regression/OLS without Group Dummy Variables: The intercept terms relating to individual specific countries and products are assumed to be equal. Thus, the equation can be written as $Y_{ijt} = \alpha + \beta' X_{ijt} + \varepsilon_{ijt.}$, and this model is estimated by simple Ordinary Least Squares.

2. Least Squares with Intercept Dummy Variable: The Fixed Effects Model with individual specific intercept constant terms (for countries) is estimated by Ordinary Least Squares. It must be noted that the model is formulated with a C group specific constant terms and not the overall constant.

3. Random Effects: The Random Effect Model is estimated by feasible two step GLS.

After obtaining the estimates from the above-mentioned three types of models, the next step is to select the appropriate model. Therefore, the choice is between: (a) the OLS, (b) Fixed Effect and (c) Random Effect Models. Two tests were used for the selection of the appropriate model, namely: (a) the Lagrange Multiplier (LM) test, and (b) the Hausman's test. The Lagrange Multiplier test statistic shows whether the Fixed Effects Model/Random Effects Model is better than the Classical Regression Model/OLS. The Hausman Test helps to make the appropriate choice between the Random Effects Model vis-à-vis the Fixed Effects Model.

Table 2: Regression Results of India's Process Food Export on SPS Index: Classical, Fixed Effect and Random Effect Models

$$lEXP_{ijt} = \alpha + \beta_1 \, lGDP_t + \beta_2 \, lIMP_{ijt} + \beta_3 \, DIS_j + \beta_4 \, lPOPI_t + \beta_5 \, lPOP_{jt} + \beta_6 \, SPS_{ijt} + \in_{ijt}$$

Estimated Classical Model - OLS			Other Estimated Parameters
Name of Variables	Estimated Co-efficient	t-Statistics	
SPS	-0.01089	3.28	N = 112 $R^2 = 0.30$
lIM	0.4367	4.04	
lPOPI	23.4691	0.53	
lPOP	0.4726	1.60	LR Multiplier Test Statistics = 2.14 Hausman Test Statistics = - 0.01
lGDPI	-4.23	0.64	
lDIS	1.91	1.25	$\sigma_\mu^2 = 0.25$ $\sigma_e^2 = 6.82$
Constant	-398.75	0.52	

Source: Authors' estimates. The estimates of LM and Hausman tests show that Fixed Effects Model is better than the OLS at 10 per cent level of significance. But at the 5 per cent level of significance, it is not accepted. Hence, we have selected OLS model over FE/RE models.

The first set of results using the Lagrange Multiplier test revealed that the Fixed Effect Model/Random Effects Model was not better than Classical Regression Model (OLS without country dummies). Thus, the Classical Regression Model was chosen, and the results are presented in Table 2. As can be seen from the regression results in Table 2, the negative sign of the SPS coefficient indicates that the impact of SPS (in importing countries)

on processed food exports from India is negative with a very high degree of significance at the 1 per cent level. The positive impact of imports by developed countries on India's export is shown by the coefficient of lIMP, i.e. (.4367), which is statistically significant at the 1 per cent level. Variable POPI is not significant. But population of developed countries (lPOP) is significant at 1 per cent level. Distance between countries does not seem to matter. One possible explanation for this is that, most countries considered (in sample) are equi-distant from India. Perhaps, this variable may have gained in importance if the countries chosen were both far and near India (i.e. a sample of countries from both developed and South Asia).

2. Inter-country Differences in FSS

This section tries to test the following hypothesis:

Hypo: Effect of inter-country differences in food safety standards is different on India's processed food exports.

After proving that food safety standards imposed by developed countries, in general, do impede processed food exports from India, the next step is to probe more deeply whether inter-country differences in food safety standards among sample countries have any significantly different negative effect on India's processed food exports. To test this, we modify the equation (1) assuming that β_6 coefficient is different for different countries. In other words, β_6 is replaced by β_{6j} in equation (1). The estimated results are presented in Table 3.

As Table 3 portrays, with country specific slope coefficients of the SPS index, the coefficients of all the countries are either negative or statistically insignificant. The negative co-efficients indicate the negative role-played by SPS on processed food exports from India. A closer look at the coefficient values reveals the impact of SPS standards in US, Japan and France is not statistically significant. The stringency of the SPS standards is much greater in the case of UK, Australia, the Netherlands and Germany. The F-statistic of regression equation signifies the overall rigour, and explains the meaningfulness of the coefficients.

Table 3: Regression Results of India's Process Food Export on SPS Indices of Different Countries: Classical, Fixed Effect and Random Effect Models

$$l\text{EXP}_{ijt} = \alpha + {}_1 l\text{GDP}_t + \beta_2\, l\text{IMP}_{ijt} + \beta_3\, \text{DIS}_j + \beta_4\, l\text{POPI}_t + \beta_5\, l\text{POP}_{jt} + \Sigma^7_j\, \beta_{6j}\, \text{SPS}_{ijt} + \in_{ijt}$$

Estimated Classical Model - OLS			Other Estimated Parameters
Name of Variables	**Estimated Co-efficient**	**t-Statistics**	
lIM	0.4334	3.744	
lPOPI	24.0933	0.542	
lPOP	-0.3416	0.396	
lGDPI	-4.2392	0.643	
lDIS	3.7824	0.87	N = 112
SPS_US	0.00076199	0.031	R^2 = 0.33
SPS_JP	-0.000108588	0.008	
SPS_AU	-0.016986871	2.071	LR Multiplier Test Statistics = 2.95
SPS_FR	-0.003173962	0.437	Hausman Test Statistics = - 0.43
SPS_GR	-0.006775802	2.053	
SPS_NL	-0.014785687	2.364	σ^2 = 75.92
SPS_UK	-0.01445648	2.974	σ_e^2 = 6.07
Constant	-413.4358019	0.543	

Source: Authors' estimates based on survey given in Mehta, Nambiar and Arockiasamy (2005).

3. Current Performance and Potential

In this section, an attempt is made to test the following hypothesis:

Hypo : There is an economically 'recoverable' gap between current performance and potential of India's export, which is influenced by factors such as information deficiencies (lack of transparency of standards, delays in notification, absence of established standards, etc.)

Table 4: Indian Shrimps Exporting Units: Sources of Information about FSS and the Status of Profit 2001-02

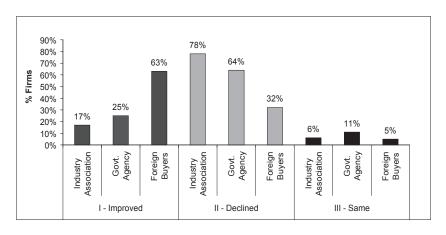| Source of information	Industry Associations				Govt. Agencies				Foreign Buyers			
Profits	**Improved**	**Declined**	**Same**	**Total**	**Improved**	**Declined**	**Same**	**Total**	**Improved**	**Declined**	**Same**	**Total**
USA	3 (17%)	14 (78%)	1 (6%)	18	7 (25%)	18 (64%)	3 (11%)	28	12 (63%)	6 (32%)	1 (5%)	19
Japan	3 (21%)	11 (79%)	0	14	5 (26%)	13 (68%)	1 (5%)	19	4 (29%)	9 (64%)	1 (7%)	14
Australia	0	0	0	0	0	0	0	0	0	1 (100%)	0	1
France	1 (17%)	5 (83%)	0	6	2 (22%)	7 (78%)	0	9	1 (17%)	5 (83%)	0	6
Germany	0	4 (100%)	0	4	1 (11%)	7 (78%)	1 (11%)	9	0	5 (100%)	0	5
U.K.	1 (14%)	5 (71%)	1 (14%)	7	2 (20%)	6 (60%)	2 (20%)	10	1 (25%)	3 (75%)	0	4
Total	8 (16%)	39 (80%)	2 (4%)	49	17 (23%)	51 (68%)	7 (9%)	75	18 (37%)	29 (59%)	2 (4%)	49

Source: Authors' estimates based on survey given in Mehta, Nambiar and Arockiasamy (2005).

This hypothesis could not be put to a regress test for lack of sufficient data. What we could put to test was only a part of it. Hence we re-formulate the hypothesis as:

Hypo : Current performance and potential is influenced by factors such as information deficiencies and sources of information.

The prevailing perception arising from conventional wisdom is that if a greater degree of information[4] is made available to Indian exporters with regard to Food Safety Standards (FSS) of importing countries it will lead to an increase in processed food exports from India, which in turn will result in greater profitability to the food processing units. A glance at the surveyed shrimp units with regard to sources of information on food safety standards indicate that a considerable amount of information is said to flow from the government agencies. Table 4 and Figure 1 highlight two important points:

Figure 1: Indian Shrimp Exporting Units: Source of Information about FSS and Profit Status: Indian Exporters' Perception about the US Market

Source: Authors' estimates based on survey given in Mehta, Nambiar and Arockiasamy (2005).

i   *Although a general dissatisfaction prevails among Indian exporters with regard to the role of government in export promotion, the surveyed units unanimously agree that the government is better in dissemination of information on food safety standards than their own industrial associations.* From Table 4 it can be pointed out that in case of all destination countries the number of Indian shrimp exporting units that access information from government agencies is higher than the number of units getting information from either industrial associations or foreign buyers. For example, in case of the US market, 28 exporting units obtain information from government agencies, whereas this number is 18 and 19 in case of those getting information from industrial associations and foreign buyers, respectively.

ii *As can be expected, the profit margins of the firms improve with qualitative information provided by foreign buyers.* For an illustration, in case of the US market, as shown in Figure 1, the percentage of total exporting units whose profit has increased compared to the previous year is higher for the group of firms that obtain information from foreign buyers than that of the groups accessing information from either industrial associations or government agencies. Similarly, if we look at the percentage of firms that report a decline in their profit, it is the lowest for the group of firms that are getting information from the foreign buyers.

These observations imply curiously that even though the government provides the necessary information, this does not translate into an increase in the profit of the processed food-exporting firms. Therefore, it is not just information per se, but the quality of information that has a crucial impact on the profit of the firms. Thus, it can be said that the gap between the current performance and the potential can be bridged if the government provides more qualitative information similar to those provided by foreign buyers. In this context it may be meaningful to narrate the experience of one of the shrimp exporters. Foreign buyers provide the exporters not only the information on food safety standards but also the way to meet them, including the tips on how to beat the system such as information on more restrictive and less restrictive ports to get their goods across, etc.

Table 4 and Figure 1 paint a gloomy picture of a general trend of declining profit margin. However, in the case of the US market, with the access to information from foreign buyers about 63 per cent of the firms report an improvement in their profit compared with to previous year. Therefore, while the qualitative information provided by foreign buyers seems to translate into an improvement in the profit of firms that has not been the case with the vast information flowing from the government sources. It can only be concluded that in the absence of information, perhaps the drop in profit margin may have been greater. However, as Table 4 indicates, in spite of the information coming from different sources, the profit margin is reported to decline in general.

4. Implications

The need to understand precisely how the stringent food regulations implemented by developed countries against imports affect India's exports of processed food to these markets has been the main concern of this study. Towards that proximate goal, the preceding sections analysed the impact of SPS and other variables like population, geographical distance and total imports of destination countries of shrimps, mango pulp, egg powder and mushroom while using a gravity model. A striking observation from this exercise is that the SPS co-efficient has not only the negative sign but is also statistically significant. Some of the implications arising from this empirical evidence and also some other may now be drawn.

It is important to emphasis that the high food safety regulations unleashed by developed countries are a major impediment to India's exports of processed food to these markets. The latter's appetite for imports of processed food from India remain insatiated (implying that demand is not a constraint). But the main hurdle is neither the distance, nor the lack of demand; it is rather the high food safety regulations of these countries, which act as a roadblock. The lack of harmonisation of standards of sample countries with Codex standards disrupts India's exports. One way to highlight this trade hostility is to estimate the probable export loss to India because of lack of harmonisation of standards. The empirical procedure adopted for calculating this export loss is as follows. We calculate first an SPS elasticity

measure defined as the percentage change in exports due to a change in SPS standards, the latter is calculated using Codex standards as a benchmark (i.e. more the deviation of a country's SPS index from the Codex standard, the more severe are that country's food safety standards and vice versa). The year 2003 is considered for measuring the deviations of SPS from Codex. As a next step we apply this elasticity to the India's exports of base year, to developed countries concerned. Our results show that export loss of India of processed food was 156 per cent from the present level of export.

It is also important to realise that processed food exports from India to these developed countries are disrupted not only by the high level of food safety standards of these countries but also by the differences in those standards across these countries. This is confirmed by regression results with coefficients (or elasticities) of SPS index separately for each country. The country specific SPS coefficients are negative confirming the negative role played by SPS on processed food exports from India. Among the sample countries the UK, Australia, the Netherlands and Germany operate a far more restrictive regime than France and Japan. Using these co-efficient we can estimate export loss to India due to difference in elasticities (based on co-efficients). The estimated results are presented in Table 5.

The elasticities reported here are the average elasticities and these average elasticities are found to vary from -1.5966 for the Germany to -2.7773 in the Netherlands. On the whole, elasticity values are relatively high for the Netherlands, Australia, Germany and UK and insignificant for USA, Japan and France.

The estimates of trade loss bring out the following points.
1. The magnitude of export loss is much higher in the case of Germany, UK and the Netherlands and much lower in case of Australia. It is due to relatively low level of India's exports to Australia, in the base year. The total loss to these countries is more than 100 per cent from the present level. India has lost 18 per cent of its total exports due to inter-country differences in SPS measures.

Table 5: Export Loss to India from Higher SPS Standards

	Product	Average Elasticity	SPS Index 2003; Codex 2000 (=100)	Export Loss-% (w.r.t. to value of base year =2003)
Australia	Mushroom	-2.2889	246.759	136.1
	Egg powder		103.552	7.8
	Sub total			**97.5**
Germany	Mango pulp	-1.5966	113.792	19.4
	Mushroom		355.935	114.8
	Sub total			**113.8**
Netherlands	Mango pulp	-2.7773	113.792	33.7
	Mushroom		359.732	200.5
	Egg powder		103.182	8.5
	Sub total			**70.3**
UK	Mango pulp	-1.8375	170.042	75.7
	Mushroom		367.241	113.7
	Sub total			**130.8**

Source: Authors' estimates based on survey given in Mehta, Nambiar and Arockiasamy (2005).
* We have not given results of three countries: US, Japan and France because SPS co-efficient is insignificant

There are clear indications that foreign buyers provide better information about food safety standards in their respective countries than our government departments and industry associations. The responses from the surveyed units indicate that wherever the information source for exporters is foreign buyers, the improvement in profitability is relatively high. On the

contrary, the information provided by either the government departments or industry associations does not necessarily translate into an improvement in profitability. The implication, of course, is that there should be greater and deeper involvement of both the government and industry associations in the export activities of processed food.

5. Select Concluding Observations

This study sought to understand more precisely how the food safety regulations applied by the industrialised countries affect India's exports of processed food to these markets (i.e. the relationship between India's exports to these markets and the prevailing FSS regulations in these countries). At the end of this paper, we summarise our main findings. Several points seem worth making.

- Very stringent food safety regulations currently prevailing in developed countries do tend to restrict India's exports of processed food to these countries. This is evident from the estimates of the Gravity model utilised here to capture the impact of SPS along with other variables such as population, import and geographical distances. In the estimates, the coefficient of SPS has not only the expected negative sign but is also found statistically significant. The message is that the main hurdle for India's exports of processed food to these markets is neither the lack of demand nor the geographical distance, but it is the stringent food safety regulations prevailing in these countries.

- Inter-country differences in food safety standards also have a strong negative impact on India's processed food exports – in the regression estimates with country specific SPS index, the coefficients of all countries are negative except one. The advantage with this country-wise estimate is that one can judge from a careful look at the values of these coefficients which of the countries from the sample group are harsher to India in terms of the stringency of food regulations. Thus, UK, Australia, the Netherlands and Germany are found to be harsher to India in terms of increase in restrictiveness of food safety regulations than say France, USA

and Japan. To highlight the probable impact of these inter-country differences in food safety regulations, we estimated the potential export loss to India because of differences in standards.

- It was striking to note that India stood to loose around 156 per cent of the actual export of processed food to developed countries. A portion of this loss is due to inter-country differences in standards. Alternatively, India would have gained 19 per cent more than the actual if the increase in standards was same among all countries. Country differences in SPS measures also tend to diminish the competitive advantages and weaken the ability of small firms to maintain their profitability.

- There is a tendency for the firms to be in general, better off in terms of profitability wherever the source of information is 'foreign buyer'. On the contrary, firms, which depended on information supplied either by government departments or industry associations, are seen to have ended with lower profitability. This proves that foreign buyers provide better information about the prevailing food safety regulations and how to meet those obligations than the guidance received either from government departments or industry associations.

Endnotes

[1]   For details of international standards set up by Codex, see Mehta and George (2005), among others

[2]   The basic gravity model, originally proposed by Tinbergen (1962) and developed by Peyhonen (1963) and Linneman (1966), considers two determinants: (1) the size of trading countries, expressed in terms of GDP and per capita GDP, and (2) trade costs in terms of geographical distance between them. GDP and per capita GDP are considered because (a) the size of exporting country captures the exporters' supply capacity, and (b) the size of the importing country captures the importer's demand capacity. The trade costs involve trade frictions, which arise owing to geographical distance, cultural differences, etc. It is assumed that the greater the geographical distance between countries, the higher will be the transport costs and increased difference in preferences.

[3]   Total number of observations (4 x 4 x 7 = 112) is based on 4 year's trade statistics, 4 commodities and 7 countries.

[4]   Level of food safety standards in importing countries. In this context it should be noted that level of FSS change over time.

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