Exports of Environmental Goods and Services (EGS)

Exploiting the Global Demand

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There is a huge potential in India for exporting environmentally friendly goods that will attract a tariff. India needs to make appropriate policy changes to enable it to take advantage of this huge and growing market. An exploration of the data and a measurement of the gap between potential exports and actual exports in these environmentally friendly goods market, using a model developed by the authors, throw up evidence that Indian governance constraints have had a huge negative effect on the exports of environmentally friendly goods.

What are environmental goods and services? A clear definition of EG is important because it will set clear parameter on the types of goods that are actually liberalised. There are different approaches to identifying goods that have been proposed by WTO over the past few years for multilateral liberalisation of trade in EG. The first suggestion is a list of environment-friendly products as proposed by the Friend of Environmental Goods group including Canada, EU, Japan, Republic of Korea, New Zealand, Norway, Switzerland, Taiwan and the US. The list has a wide coverage containing 153 goods with the aim of securing a zero tariff for these products by 2013. In addition, India has advocated the 'environmental project approach', where each WTO member designates a national authority to select environmental projects based on criteria developed by the Special Session of the Committee on Trade and Environment. Following the framework of the WTO, EG can be classified by 12 groups namely, air pollution control, management of solid and hazardous waste and recycling systems, clean up or remediation of soil and water, renewable energy plant, heat and energy management, waste water management and potable water treatment, environmentally preferable products based on end use or disposal characteristics, cleaner or more resource efficient technologies and products, natural risk management, natural resources protection, noise and vibration abatement, and environmental monitoring, analysis and assessment equipment (Monkelbann 2011).

Table 1: India's Exports of EG to the World (US$ '000)

Product description	2005	2006	2007	2008	2009	2010
Air pollution control	214,623	437,949	540,241	724,312	626,656	1,033,679
	23	49	41	12	56	79
Management of solid and hazardous waste and recycling systems	423,145	466,624	604,740	681,157	587,238	546,804
	45	24	40	57	38	4
Clean up or remediation of soil and water	17,514	25,529	64,292	4,099	90,333	69,379
	4	9	2	9	3	
Renewable energy plant	608,770	1,172,015	1,551,932	2,627,162	2,071,148	2,210,387
	2	8	0	67	95	3
Heat and energy management	37,862	41,158	72,490	101,267	207,895	195,493
	2	8	0	67	95	3
Waste water management and potable water treatment	810,145	1,045,467	1,333,873	1,855,767	1,542,465	1,746,190
	45	467	873	767	465	90
Environmentally preferable products, based on end use or disposal characteristics	73,641	75,547	71,444	93,548	63,886	116,729
	1	7	4	8	6	9
Cleaner or more resource efficient technologies and products	13,520	9,075	7,826	3,001	18,564	36,918
	0			1	4	
Natural risk management	17,508	31,711	34,224	41,729	82,670	30,817
	8	1	4	9	0	
Natural resources protection	18,403	20,553	10,424	14,378	21,906	29,685
	3	3	4	8	6	
Noise and vibration abatement	368,355	472,822	562,707	658,961	469,918	624,469
	55	22	07	61	18	9
Environmental monitoring, analysis and assessment equipment	99,006	102,801	156,070	233,237	295,494	330,205
	6	01	70	37	94	5

India's exports of EG: Although the sector that produces EGS was virtually non-existent in India two decades ago, India has become a major exporter of these goods and a promising market for them. The domestic environmental industry is still highly disorganised and is dominated by small scale units (Katti 2005).

The contribution of EG exports has been increasingly important for India. Table 1 shows the export values of EG by groups over time. According to the recent data of India's exports of EG, the Asia-Pacific countries are the important markets for EGS from India and the value of India's EG exports to these markets has been increasing overtime. The US is a major importing partner, accounting for most of India's EG. For example, about 20 per cent of the EG consisting of renewable energy plant group was exported to the

US market in 2010. The values of goods in the groups of waste water management and potable water treatment and noise and vibration abatement sold in the US were around $ 300 million and $ 180 million, respectively. In addition, China, Thailand, Malaysia and Australia are also dominant importers of India's EG in the groups of clean up or remediation of soil and water (China $10 million, Malaysia $8 million), management of solid and hazardous waste and recycling systems (Thailand – $ 34 million) and heat and energy management (Australia – $ 35 million).

Analysing the Data

***Methodology*:** Gravity model is a tool to examine the determinants of exports flows between countries. It was first applied by Tinbergen (1962), which is based on the principles that the export between two countries generally has positive relation with gross domestic product (GDP) but negative relationship with the geographic distance between countries. The conventional gravity model, which is described as a regression equation in logarithm having export as the left hand side variable and GDP and distance between trading countries as right hand side variables, has been criticized for its lack of theoretical underpinnings, and its issue with omitted variables bias due to the exclusion of 'trade resistances', such as 'behind the border' constraints or non-tariff barriers from the gravity model. To deal with these problems, researchers have suggested different methods of modelling and estimation of the gravity equation.

Kalirajan (2008) suggested a methodology to model and estimate the gravity model taking into account of 'behind the border constraints' drawing on the modelling and estimation procedures used in the stochastic frontier production function literature. The advantage of using the stochastic frontier gravity model is that it is possible to incorporate and measure the effects of 'behind the border' constraints on exports, when the researcher does not have full information about these constraints.

Now, export potential is defined as the maximum possible export that can be achieved in contrast to the average export estimated using the conventional gravity model analysis. Export potential tells us what export would be in a hypothetical case of frictionless and free trade regime. Therefore, the ratio of the actual exports to the potential exports is called the 'export efficiency'.

Drawing on Kalirajan (2008), the export growth can be decomposed in terms of different components of the determinants of export growth, such as 'natural' determinants, 'behind the border' determinants, 'explicit beyond the border' determinants, and 'implicit beyond the border' determinants. Thus, the supply of EG (X) depends on many factors. First, it depends on the GDP and population of importing countries. The assumption is that higher income and population in the foreign countries would generally lead to increase in demand for EG from India. However, the relationship between distance and EG exports is negative due to the higher cost of transportation. These factors can be named as 'natural determinants' of export flows between countries.

Next, 'explicit beyond the border' determinants such as the relative price of the imported goods and services that are mainly influenced by importing countries' tariff and exchange rate are another factors affecting export performance. This factor is expected to have negative correlation with EG exports because increasing tariffs and the devaluation of the domestic currencies lead to higher imported prices in domestic market. Therefore, the demand for imports is reduced.

Different kinds of institutional and infrastructural rigidities that exist in the exporting countries, such as poor port facilities may influence exports negatively and these factors may be referred to as 'behind the border' determinants in the home country, which are under the control of the exporting countries. Unfortunately, it is difficult for the researchers to quantify all the 'behind the border determinants' individually. Nevertheless, the combined effects of all these determinants can be modelled as a random variable with a truncated normal distribution.

Also, different kinds of institutional and infrastructural rigidities that exist in the importing countries also would influence export flows negatively, and these factors may be called as 'implicit beyond the border' determinants, which are beyond the control of the exporting countries. It is modelled as a random variable with a full normal distribution.

Free trade agreements (FTA) that are in the forms of improvement in trade promotion and facilitation policies of both India and its trading partners are expected to positively influence EG exports of India. A dummy variable (TA) can be used to represent whether there are such trade agreements and the influence of these factors on exports may be named as 'mutually induced determinants'.

The methodology for decomposing the changes in exports between two time periods, say between 2005 (period 1) and 2010 (period 2) is explained as follows: (i) the difference between actual exports in period 2 and period 1 is calculated and let it be called DX; (ii) the potential export frontier of home country (India) in period 1, which gives the potential exports in period 1, is estimated using the export data and the software called FRONTIER 4.1 and the export efficiency is calculated as EF1; (iii) the potential export frontier of home country (India) in period 2, which gives the potential exports in period 2, is estimated using the export data and the software called FRONTIER 4.1 and the export efficiency is calculated as EF2; (iv) the difference between export efficiency in period 1 and period 2 resulting from changes in 'behind the border' constraints in home country is calculated and it is named as EF; (v) the difference between the potential frontier in period 1 and the potential frontier in period 2 evaluated at the same levels of determinants of exports in period 1 is calculated as the impact due to the change in 'implicit beyond the border constraints' and it is named as TP; (vi) now, adding TP with EF and then subtracting the sum from DX gives the impact of changes in 'natural determinants' and the 'explicit beyond the border' constraints, which include tariffs and exchange rates.

Thus, the changes in exports between two periods may result from the reduction in 'behind the border' constraints over time through home country domestic reforms; reduction in both 'explicit and implicit beyond the border' constraints in partner countries due to partner countries' reforms and mutual discussions; increase in export demand in partner countries due to increase in partner countries' income levels and population, and, implementation of trade agreements between home and partner countries.

Nature of Data: EG used in this study are the WTO 153 lists, which are divided into 12 groups. The data of exports of EGS from India is collected from the official website of World Integrated Trade Solution (WITS) in the period between 2005 and 2010, while GDP, population and exchange rate are derived from the official website of World Bank (WB) and the data of distance is calculated between capital cities, between India and its partner countries through the website of Distance Calculator. Tariff data is extracted from WITS by HS 6-digits and then tariff is calculated by average tariff for 12 groups of EG. Trade agreements are collected from the website of the Ministry of Commerce and Industry of India.

Making Sense of the Evidence

Changes in India's EG exports is decomposed as discussed above for the 12 groups of EG for the selected 10 Asia-Pacific economies, which are the major trading partners of India for EG, for 2 periods 2005 and 2010. The results show that in most cases, the 'behind the border' constraints, which are under the control of India, have negative effects on India's EG exports, while the reduction of the 'implicit beyond the border' constraints, which are under the control of India's trading partners, have contributed strongly positively to the EG export growth. The former result indicates that India should take serious reform measures to eliminate its 'behind the border' constraints.

EGS can benefit the Indian economy in terms of not only increasing its national income, but also improving environmental conditions at the national level. A stochastic frontier gravity model has been used here to examine whether India has achieved its EG export potential with its top ten export markets of the Asia-Pacific economies, using the WTO 153 list classified into 12 groups for the two periods 2005 and 2010..

The results show that the institutional and infrastructure rigidities of India, which are the main causes for the emergence of the 'behind the border' constraints, exert dominant negative effects on its exports of EG. But the negative effects were not significantly large for the EG exports group of renewable energy plant. The reduction in India's trading partners' 'implicit beyond the border' constraints has made significant contribution to India's exports of EG, especially in recent years between 2005 and 2010. The export growth changes due to 'explicit beyond the border' constraints are relatively small. These results show that India should eliminate its 'behind the border' constraints.

To promote exports of EG, India needs to improve its infrastructure and institutional framework, that are central to India's exports. We were unable to identify specific

'behind the border' constraints due to lack of uniform data; but some evidence-based conjectures can be made. For example, India can improve the performances of its exporting firms by widely disseminating information on importing countries' laws related to EG. Also, port facilities can be improved for efficient functioning and bureaucratic delays in dispatching EG need to be eliminated. At a broader level, India should evolve trade agreements and multilateral/bilateral negotiations effectively to reduce the negative impact of its trading partner countries' 'implicit beyond the border' constraints on India's EG exports.

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