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International Trade Modeling Indices and Measurement Issues

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Caution!

International Trade Modeling
Indices and Measurement Issues

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I

Trade indices are used to measure different aspects of a country's participation in world trade. Such indices range from Trade Openness Index (TOI) measuring the degree of openness of a country, to Commodity Concentration Index (CCI) and Revealed Comparative Advantage (RCA) measuring diversity and competitiveness of a country's export basket. However, each index being a summary measure has its own limitation and specific use. One must, therefore, be extremely careful in drawing policy conclusions from the values of these indices obtained in the context of a given data set at hand.

This lecture will discuss some of these indices and how they can be used in the analysis of international trade data, cross-country or time series. But, instead of analysing each index in a disjointed way, I shall discus them in the particular context of nature of export basket and trade performance of a country.

II
Nature of Export Basket and Trade Performance

For any developing country for which international trade is a critical element of its long term development strategy, or for a country entering international trade after long periods of protectionism and almost isolation from the rest of the world, one important question that needs to addressed is, what should be the desirable pattern and composition of trade. The answer, of course, may vary depending upon the immediate target that the country under consideration wants to achieve through exports, in particular, and international trade in general. For example, if the top priority of a country to promote exports is to earn scarce foreign exchange to finance imports of necessary intermediate goods, it is desirable to gain competitiveness and specialize in those manufacturing exports that are relatively less import intensive, so that "net" foreign exchange earned by them is relatively large. A point in case is India's comparative advantage in exports of gems and jeweler. For decades, the shares of these goods in India's manufacturing exports have

been quite high. But these exports, being highly import intensive, contribute relatively quite small amount to India's foreign exchange kitty. Thus, the market-driven *efficient* allocation of resources may not be a desirable one as far as the "net" foreign exchange earned through such resource allocation is concerned.

The other, and perhaps the most dominant, objective of promoting exports is to achieve higher growth rates in GDP, both aggregate and per capita. There are several reasons for pursuing the growth objective, among which *the* most important of all to me is eradication of poverty. The conventional wisdom in the economic literature has been that the indirect growth-augmenting policies are not only relatively more effective in alleviating poverty, but also are more sustainable in the long run compared to the direct poverty-alleviating measures. For example, provision of public resources financed by taxes (such as the food-for-work programmes) puts a pressure on the limited availability of economic resources. Alternatively, the deficit financing to fund such programmes is not sustainable in the long run. On the other hand, as articulated by Kuznets (1953), with acceleration of the growth of output, the opportunities for upward income mobility for the lower income groups gets stronger, which, in turn, have a more sustaining favourable impact on the incidence of poverty.

International trade affects output and income growth in many ways. The foremost argument dates back to the productivity theory of Adam Smith: international trade by widening the extent of the market creates further scope for division of labour, which, in turn, raises the skill and dexterity of the workforce, encourages technical innovations and enables the producers to reap the benefits of increasing returns [Myint (Economic Journal, 1958)]. All these contribute to output growth. The more recent arguments are based upon the (effective) demand augmenting effect of increased "net" exports (Keynes and Kalecki), and the neo-classical income distribution effect on the rate of savings and capital formation. The basic premise of the neoclassical link between trade and growth through income redistribution is that the workers save less than the non-wage earners out of an additional Rupee earned. However, the income distribution effect of international trade liberalization on output growth may go either way depending upon whether the export production is more labour or more capital intensive relative to the production of the import-competing goods. In the former case, reduction of tariff duties, for example, on imports of the capital-intensive goods,

lowers the rate of return to capital and raises the wages à la the celebrated Stolper-Samuelson theorem. With the marginal propensity to save out of wages being lower, this lowers the rate of aggregate savings and, therefore, the rate of capital formation in the economy. However, as documented in Marjit and Acharyya (2003), the country experiences for the last two decades and a half reveal that the unskilled workers have lost relative to the skilled workers and non-wage earners almost universally. This means that the income-redistribution of free trade may work in favour of growth augmentation.

There are three caveats, though. First, there are both success and failure stories regarding the trade-growth nexus. Second, growth effect may not trickle down as the Indian experience during the 1970 and 1980s show. In particular, growth by itself may not lower the incidence of poverty. Third, as demonstrated by Kuznets (1953), growth initially tends to increase income inequality, which may not be acceptable socially and also politically in the democracies where the policies with minimum political risk are often favoured. There has, in fact, been a sharp rise in income inequality as measured by the Gini coefficient after 1993 (See Figure 5). By 1997, the value of Gini rose to 40 percent, which had been the highest value recorded since the Independence.

Figure 1: All India Gini Coefficient
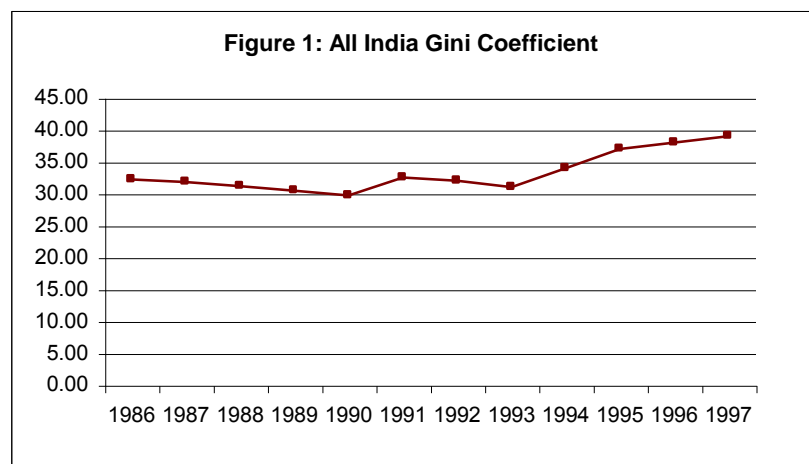
Source: Reproduced from Acharyy (2006).

Regarding the first, we should note that international trade plays powerful role in the development process only when the internal mainsprings of growth function well. Physical infrastructure like power, ports, roads and telecommunication, is one such critical element of the internal mainsprings

of growth. Thus poor infrastructure constrains export growth and weakens the trade-growth nexus. For India this has been emphasized by Raychaudhuri, Acharyya, Marjit and Rahman (2002) and Srinivasan and Tendulkar (2003)[1]. The World Development Report of 1994 also points out the positive impact of rural roads and irrigation on agricultural output and income in India and Bangladesh. Thus, further policy interventions are required to remove these constraints on the potential impacts of trade liberalization.

Regarding the second, it is true that not all kinds of growth is poverty alleviating. In fact, some types of growth may well be immiserizing as well articulated by by Bhagwati and Johnson and of late is neatly summarized in Srinivasan and Bhagwati (2003). But this should not be taken as growth in general does not have any favourable effect on poverty. My take on growth and poverty is that, growth is necessary but not a sufficient pre-condition for sustained poverty reduction. A growth-augmenting policy should be accompanied by a proper redistributive policy, the scope of which is created by growth itself, for making growth work for the poor.

Finally, rising income inequality in a growing nation may simply be a reflection of unequal opportunities for the lower-income group people to formal and technical education and skill-formation. Whether income inequality per se is bad and should be a policy target may be a debatable issue. But if opportunities for upward income mobility can be created through rapid growth, we must not be too rigid in mind set against the immediate adverse effect of the trade induced GDP growth biased in favour of the relatively skilled workers and the rich. Instead, we should put efforts to ensure that larger section of the mass can improve their productive capacity, skill and capability to take advantage of the opportunities for upward income mobility created by such growth.

From this perspective of trade-growth-poverty nexus, the pattern of exports that is desirable for a developing nation should be of the following types:

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[1] Applying Principal Component Analysis, Raychaudhuri et al. (2002) construct Infrastructure Stock Index for India, Bangladesh and Sri Lanka and estimates (partial) elasticities of exports of these countries (to their major destinations) with respect to such an index. Such estimated elasticities are quite high for Indian exports to USA, Canada and to major EU countries, ranging from 1.74 for exports to Belgium to 1.12 for exports to Australia.

1. *Diversified export basket in terms of both destination and composition of exports*: A concentrated export basket means a narrow range of comparative advantage. Under such circumstances, world demand shocks or domestic supply shocks in even a smaller number of commodities trigger large adverse effect on the growth in total export earnings. Under a diversified trade pattern, on the other hand, such commodity-specific shocks produce only small changes in overall export earnings. It is thus important to have a diversified export pattern to maintain a stable export growth and sustained impact on output growth.

2. *Aligning the composition of export basket with the changing pattern of the world demand*: Exporting what we can do best is not sufficient, but doing best in goods whose relative world demand is growing is the need of the hour. For example, in the present era of globalization, revolution in information technology in the West has caused large shifts in the demand for high technology goods, such as aerospace, chemicals, pharmaceuticals, scientific instruments, machineries and data processing and office equipments. Thus, it is essential to gain comparative advantage in these goods and change the export composition accordingly to realize a higher (world demand-driven) export growth and stronger trade-growth nexus.

3. *Achieving growth in exports that have strong feedback effect* on the rest of the economy in terms of productivity improvement. The high-technology exports are the ones that create dynamic links with the rest of the economy in terms of skill formation, productivity increase and product diversification, and thereby makes trade-growth relationship stronger. It is also desirable to shift from the low value addition to high-value addition exports. For example, the phenomenal growth of the Indian software industry and its exports in the 1990s has been primarily due to outsourcing of low value addition activities by the foreign multinationals. Such service-oriented software growth would not bring much benefit in the long run in terms of product development and output growth as in many NICs. It is of utmost importance, therefore, to encourage development of final software packages by highly skilled Indian professionals instead of performing low-value addition outsourced activities.

4. *Comparative Price Advantage and Quality Competitiveness of Exports*: Locating market-specific comparative advantages of products and competitiveness of products vis-à-vis the rival countries in the world markets are essential elements of an export promotion policy. A country may not have comparative advantages in the same set of goods in each and every foreign market. On the other hand, the non-price factors like poor quality and product standards are now becoming the major constraint on the growth of exports of the developing countries in the markets in the advanced industrialized countries where the buyers are more sensitive to quality changes than to the price cuts, and the requirements for a minimum product standards are becoming increasingly stringent.

III

Use of Trade Indices

Having the set of desirability criteria at hand for composition and pattern of exports of a country for a strong trade-growth relationship, one might wonder, first, how to quantify them and, second, how to examine to what extent a country's actual pattern and composition of exports conform to these criteria. Herein come the applications of different trade indices. Of course, I shall limit my discussion only to those indices that are relevant in the context of the above-mentioned set of desirable export composition and its pattern.

1. *Diversified export basket*

The standard measure of a concentrated export basket is Hirschman's (1945) coefficient of concentration. Denoting such index for concentration of Indian exports in the country-specific export markets by the Commodity Concentration Index (CCI), we can define it as,

$$CCI^h = [\Sigma_k \, (\alpha_{kj})^2]^{1/2} \text{ x } 100 \qquad\qquad (1)$$

where α_{kj} = share of commodity-k in total Indian exports to the destination country-j.

To measure concentration of India's exports to a regional trading bloc such as the EU, we can use this index by redefining α_{kj} as the share of exports of commodity-k in total exports to the region under consideration. We call this Regional Commodity Concentration Index (RCCI) to distinguish

it from CCI. The value of CCI (or RCCI) would be 100 if exports to a particular member country (or EU) comprises of a single commodity. This is the case of highest commodity concentration. Smaller is its value, on the other hand, more diversified the exports are in a particular market. However, this index is sensitive to the number of commodities included in the calculations and hence to the level of dis-aggregation of each commodity group.

Similarly, concentration of export destinations can be measured by the index, Geographical Concentration Index (GCI):

$$GCI = [\sum_j (\beta_j)^2]^{1/2} \times 100 \qquad\qquad (2)$$

where, β_j = share of country-j in total exports of India.

Figure 2 reports the values of the CCI of the Indian export basket for five selected destination-countries and for the world using the UNCTAD data at the 4-digit classification level. What appears is that India's total export to the world is reasonably diversified. Among the selected countries, the export basket to the USA is the most diversified with other markets closely following this value.

Figure 2: Country Commodity Concentration Index of Exports
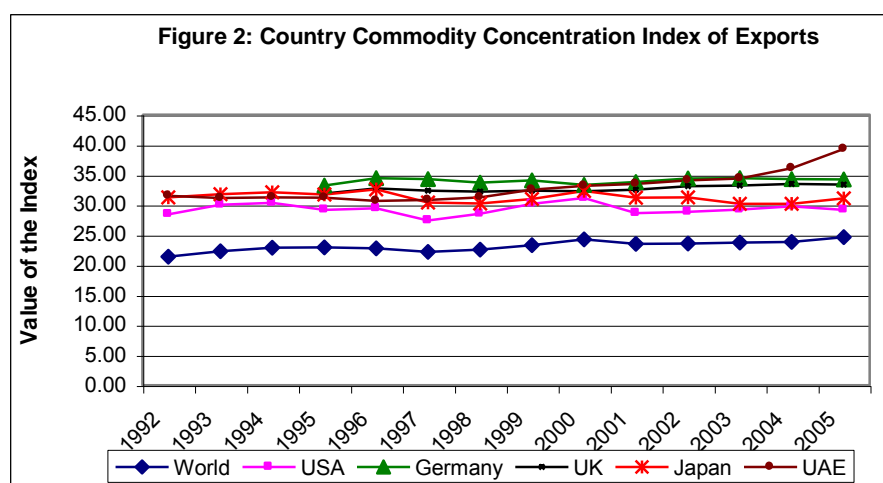
Source: Own calculations using the CMIE-India Trades database.

Table 1, on the other hand, reports diversification of India's basket of exports and imports in the context of Indo-China bilateral trade. It appears that India's exports to China have become increasingly concentrated since the turn of this century. The Chinese basket of exports (which in

the present bilateral context is essentially the basket of India's imports from China), on the other hand, has been not only more diversified, but also has grown in strength in terms of the degree of diversification. That the Indian Export basket is less diversified than China's export basket is understandable from the fact that at the HS 4-digit disaggregation, only 330 commodities account for almost the entire exports of India to China compared to Chinese exports of around 525 commodities accounting for 98 percent of her exports to India. The strong industrial base of China (see Figure 2) is perhaps the major explanation of such wide variations in the range of products that are being exported to each other by these countries.

Table 1:

CCI for Exports of India and China

	India	China
1998	22.77	17.17
1999	21.07	17.41
2000	21.05	17.66
2001	23.33	16.14
2002	28.04	14.55
2003	35.17	13.51
2004	51.83	12.93

Source: Own calculations.

2. *Alignment of a country's exports with trading partner's imports: Trade Complementarity*

There are two useful indices to measure how aligned is a country's chain of comparative advantage, and hence export basket, with the foreign import demand. One is the Trade Complementarity Index (TCI) and the other is the Coefficient of Complementarity (CC). These indices are, however, more meaningful in the context of bilateral trade between two countries.

The TCI between two countries i and j is defined as:

$$TC_{ij} = 1 - \frac{1}{2} \sum_k \left| M_{ki} - X_{kj} \right| \tag{3}$$

where, M_{ki} is the share of good-k in total import of country i, and X_{kj} is the share of good-k in total exports of country j. A higher value of this index means a higher degree of alignment of the exports of country-j with imports of country-i; the maximum value 1 indicates a perfect match. Quereshi and Wan (2006) provide an estimate of this index in the context of Indo-China bilateral trade.

The Coefficient of Complementarity (CC), on the other hand, is the co-factor approach proposed by Linneman (1966):

$$CC = \frac{\sum_k \alpha_{ij}^k \alpha_{iW}^k}{\sqrt{\sum_k \left(\alpha_{ij}^k\right)^2 \sum_k \left(\alpha_{iW}^k\right)^2}} \qquad (4)$$

where α_{ij}^k and α_{iW}^k are the shares of commodity-k in the imports of country-i from country-j and from the world respectively. This CC varies between 0 and 1. A higher value of this coefficient indicates a higher degree of complementarity between India's exports and importing-country's global import pattern.

Figure 3: Trade Complementarity
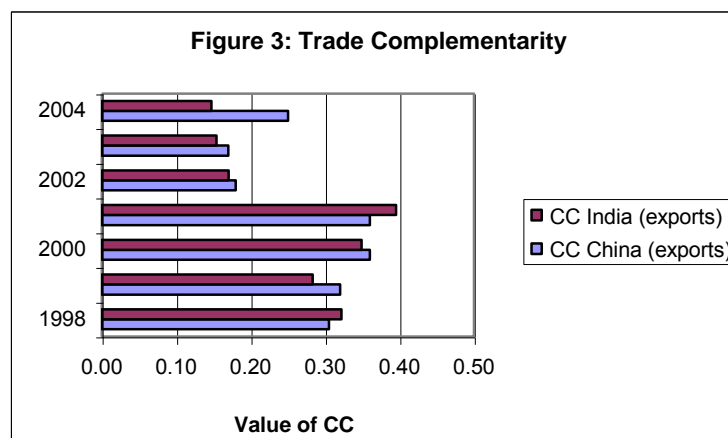
Source: Authors' calculations.

By this index the Indian exports were more aligned with the Chinese imports in the late 1990s than at present. The complementarity between India' global imports and imports from China (as shown by the blue bars in Figure 3) had a similar trend, except for last couple of years when such imports appear to be aligning better though not at the level as they were in the late 1990s. However, except

for the year 2001, Chinese exports are better aligned with India's global imports than India's exports are with China's global imports.

3. *Trade Competition*

To identify potential competitors of a country's exports in the world market, two indices are generally used: The coefficient of Specialization (CS) and the Coefficient of Conformity (CCon). These are defined as:

$$CS = 1 - \frac{1}{2} \sum_k \left| \alpha_{it}^k - \alpha_{jt}^k \right| \tag{5}$$

$$CCon = \frac{\sum_k \alpha_{it}^k \alpha_{jt}^k}{\sqrt{\sum_k \left(\alpha_{it}^k\right)^2 \sum_k \left(\alpha_{jt}^k\right)^2}} \tag{6}$$

where α_{it}^k and α_{jt}^k are the share of product-k in exports of countries i and j respectively in time t.

The difference between the two indices is the same as that between TC and CC: The CCon is essentially the co-factor approach. If both countries have the same export structure, the indices are equal to unity and the potential trade competition is high. At the other extreme, when both countries have totally dissimilar export structures, values of these indices are each zero implying low trade competition.

As an application, once again we refer to the India's exports to the world and to China. In a recent study, Qureshi and Wan (2006) have reported values of TC for world exports by China and India. This is shown in Figure 4. Clearly, there is a high degree of competition between China and India in the world market. The other curve is the locus of values of the CCon for the bilateral trade estimated using the 4-digit classification. These values capture the similarity of export baskets of China and India in their bilateral trade, or alternatively, indicate similarity of India's (China's) exports and import baskets. Thus the declining trend in this coefficient (when estimated using

bilateral trade figures) after the year 2000 clearly indicates the growing inter-industry character of the Indo-China bilateral trade as anticipated earlier.

Figure 4: Coefficient of Conformity
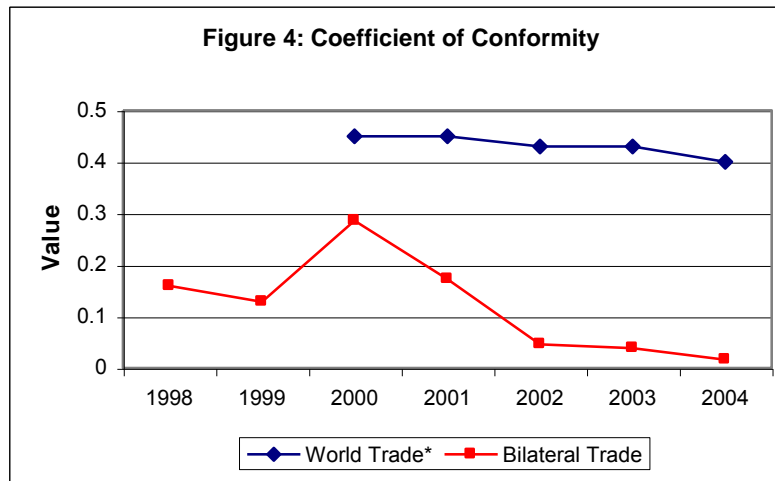
Source: Qureshi and Wan (2006) and present authors' calculations.

4. *Comparative Advantage and Export Promotion*

Finally, we come to the issue of locating product-specific comparative advantage. The concept of comparative advantage as developed independently by Robert Torrens and David Ricardo in the 19th century was couched in terms of a two good-two country framework: England and Portugal, and cloth and wine in the famous example of Ricardo. The basic idea was that if the price of cloth relative to that of wine is lower in England than in Portugal, England has a comparative advantage in cloth whereas Portugal has a comparative advantage in wine. In such a case England should devote all its resources in production of cloth and import wine from Portugal, which in turn should devote all its resources to production of wine and import its requirement cloth from England. Since international trade enables both the countries to specialize *completely* in the production of their respective comparative advantage goods, domestic resources will thus be efficiently allocated in each country and there will be mutual gain for both. This is the famous gains from trade theorem based on the doctrine of comparative advantage (CA). Since the time of David Ricardo and Robert Torrens, international trade theory has identified three sources CA (or relative price differences across countries: technology, factor endowment and tastes. Ricardo himself talked about technology differences across countries, whereas in the 1930s, Heckscher and Ohlin located CA in difference in the relative factor endowment of trading nations.

However, trade may not always be dictated by CA. International trade is essentially arbitrage (i.e., buying cheap and selling dear) across two national boundaries. Such arbitrage takes place whenever prices of the same good differ across countries even after taking account the cost of transporting the goods between those countries. But, prices may not truly reflect the costs (and hence differences in technology or in factor endowment that influences the cost of production) when, for example, the goods generate externality, either positive or negative. Consider a simple illustration reproduced from Acharyya and Raychaudhuri (2005). Suppose good 1 generates negative externality in the form of polluting the environment such that the social marginal cost (SMC) exceeds the private marginal cost (MC) of production. Good 2 does not generate any externality and thus for it SMC = MC. Now consider two countries, home and Foreign, and to take an extreme example, suppose there is no environmental tax (or regulation) in the Home country. Thus, at home there will be MC-pricing whereas abroad SMC-pricing for good 1. With everything else being the same across the two countries, no environmental tax at home makes the relative price of good 1 lower there and thus generates a CA in this polluting or dirty good. But this CA is a perverse CA, and international trade in such a case will lower welfare, both national and global.

However, for more than two goods, the relative price-measure of CA, even when there are no negative externalities and hence no perverse CA, needs to be modified because there would be too many relative prices. One convenient way of locating CA in that many-commodity case is the following. Index and arrange all the goods according to their increasing relative unit labour requirement:

$$\frac{a_{L1}}{a_{L1}^*} < \frac{a_{L2}}{a_{L2}^*} < \ ..... < \frac{a_{Ln}}{a_{Ln}^*} \tag{7}$$

Then given the wages at home and abroad, W and W^* respectively, locate the good-j such that

$$\frac{a_{Lj}}{a_{Lj}^*} = \frac{W^*}{W} \tag{8}$$

Thus, the home country will have CA in all those goods that have lower (relative) labour requirement than good-j, and the foreign country will have CA in those goods with higher labour requirements.

Bela Balassa (1989), on the other hand, developed an index called Revealed Comparative Advantage (RCA) to locate CA of a country (say, India). The construction of RCA involves three steps. First is the calculation of the Penetration Ratio (PR):

$$PR^k = \frac{\text{A country's (or India's) export of commodity-k to destination-i}}{\text{Total import of commodity-k by destination-i}} \qquad (9)$$

The next step is to calculate the Revealed Export Share (RES) of commodity-k denoted by S^k which is essentially the PR^k adjusted for the scale effect :

$$S^k = \frac{PR^k}{X_I/X_W} \qquad (10)$$

where, X_I = India's total export to an importing country

X_W = The importing country's total import from the world

Given such RES, finally the RCA is calculated as,

$$RCA_t^k = [S_t^k + (S_t^k)^2 / S_{t-1}^k]/2 \qquad (11)$$

The numerical value of the RCA would be between zero to 100 with 1 as the cut off mark. A value above 1 would show India's comparative advantage in the importing country market in k-th product.

Raychaudhuri et al. (2003) have measured RCA for India in the markets in the EU and USA. Rubber, Tyres, Fabrics, Undergarments and Outwear deserve particular attention. In Rubber, Tyres and Tubes India has no RCA in the EU market, but a stable RCA in the US market.

Table 2: RCA of India in EU and USA

sitc		EU		USA	
		1985-1989	1990-1999	1985-1989	1990-1999
36	Shellfish	Y (↑)	Y (↓)	Y (→)	Y (→)
42	Rice	Y (↑)	Y (↑)	Y (↓)	Y(↓)

Code	Product				
74	Tea and mate	Y (↑)	Y (→)	Y (↓)	Y (→)
75	Spices	Y (↑)	Y (→)	Y (↓)	Y (↑)
611	**Leather**	**Y (↓)**	**Y (↓)**	**Y (↓)**	**Y↓**
612	Manufactured leathers	Y (→)	Y (↑)	Y (↓)	Y (↑)
625	Rubber tyres, tubes etc.	X (→)	X (→)	Y (→)	Y (→)
651	Textile yarn	Y (↑)	Y (↑)	X (↓)	X (↑)
652	Cotton fabrics,woven	Y (↑)	Y (→)	Y (↓)	Y (↓)
653	Fabrics man-made fibres	X/Y (↑)	Y (↑)	X (↓)	X (↑)
654	Other textile fabrics woven	Y (↑)	Y (↓)	Y (↓)	Y (↑)
658	Textile articles	Y (↑)	Y (↑)	Y (↓)	Y (↑)
659	Floor coverings etc.	Y (→)	Y (→)	Y (→)	Y (→)
667	**Pearls, precious stones**	Y (↑)	**Y (↓)**	Y (↑)	**Y (↓)**
842	Men`s outwear,not-knitt	Y (↑)	Y (→)	X/Y (↑)	Y (↓)
843	Women`s outwear not-knitt	Y (↓)	Y (↑)	Y (↓)	Y (↑)
844	Under garments not-knitt	Y (↓)	Y (→)	Y (↑)	Y (↓)
845	Outwear,knitt,non-elastic	Y (↑)	Y (→)	X (→)	Y (↑)
846	Under garments,knitt	Y (↑)	Y (↑)	X (↑)	Y (↑)
897	Gold,silverware,jewellery	Y (→)	Y (↑)	Y (↑)	Y (↑)

Note : X indicates RCA < 1 and Y indicates RCA > 1. Trends are shown in parentheses.

Source: Raychaudhuri, et. al. (2003).

In man-made fabrics, on the other hand, it has an increasing RCA in EU market in the 1990s but no RCA in the US market. For outwear, India has gained comparative advantage in the 1990s in the US market. Similar is the case for undergarments. In all other products it has RCA in both the markets with fluctuating values.

There are, however, several limitations of this concept. First, it is an ex post rather than an ex ante measure. Thus, one must be careful about drawing parallel between Balassa's RCA measure and the Ricardian concept of comparative advantage. Second, since its value reflects competitive strength of a country in a particular as has been revealed by the data, it cannot tell us about whether the source of comparative advantage is technology, factor endowment or tastes patterns. In fact, RCA may well reflect perverse CA, instead of genuine CA, if negative externalities are present and environmental and product standards are asymmetric across countries. Third, competitiveness (or comparative advantage) is a relative term and should not just be defined in terms of physical quantity and prices as is being done in calculations of the RCA. The quality dimension of products

is an important, and perhaps the most important, determinant of competitiveness in the present era of globalization.

India's not too good export performance in terms of the above indices can largely be traced down to poor quality of its export goods in many instances. In fact, as pointed out by Sharma et. al. (1997, p. 48), Indian exporters had problems in the mid 1990s to obtain such certificates from the European agencies for the instruments and electronics exports. The dimension of quality problem is not just limited to the intrinsic quality of products. Poor packaging also adversely affects demand for exports by foreign buyers.

The technology used in many cases was not updated, resulting in productions somewhat below the international standard [Acharyya (1995), Marjit and Raychaudhuri (1997)]. Given unobservability of quality before actual consumption for many goods, the poor country-of-origin perception of the foreign buyers also had adverse impacts on both export performance and choice of product quality by the Indian firms. Poor perception regarding true quality and thus lower willingness-to-pay by the foreign buyers often discourage potential Indian producers of better quality products to raise their qualities above the average industry quality, thereby actually reinforcing the poor perception itself. An way out of this poor perception-poor quality vicious circle is to obtain ISO 9000 series certifications because these certificates can be used as a signal for unobservable quality and a substitute, an imperfect substitute though, of brand name. As estimated earlier by Raychaudhuri et. al. (2003), the value of rank correlation between the sectoral distribution of ISO-companies and sectoral distribution of exports among 17 industries had been 0.72 for the year 1996, which is statistically significant at 1 percent level. Thus there seems to be a reasonably good relationship between export values and number of ISO companies across the industries.

But performances of most of the export sectors in India are not very encouraging in this regard. The sectoral distribution of the ISO-9000 companies, as estimated by Raychaudhuri et. al., reveal asymmetric performance of the Indian industries in respect of the growth in the proportion of such companies (see Table 3).

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Table 3: Growth in the Proportion of ISO-9000 Companies in India

SECTORS	SITC	Estimated Proportion of ISO-9000 Companies $(\tilde{n}_j / N_j)$			
		1996	1997	1998	1999
Tea & Coffee	74	0.27	0.27	0.27	0.22
Dairy Products	2	0.53	0.64	0.64	0.84
Chemicals products	5	0.15	0.27	0.32	0.53
Pharmaceuticals	541, 542	0.10	0.19	0.22	0.36
Leather Products	61	0.33	0.34	0.40	0.49
Rubber & Rubber Products	621	0.56	0.57	0.63	0.64
Textile & Textile products	65	0.12	0.21	0.26	0.44
Cotton Textiles	652	0.10	0.10	0.10	0.12
Gems & Jewellery	667	0.38	0.44	0.46	0.45
Machinery & Equipment	7	0.23	0.40	0.48	0.73
Information Technology	752	0.27	0.46	0.54	0.73
Electronics		0.50	0.50	0.50	0.44
Readymade Garments	845	0.35	0.34	0.37	0.39

Source: Q-prod.com; CMIE, different issues; ISO CD-ROM.

Note: 1. The estimated share of ISO-9000 companies for sector-j in period-t, $\tilde{n}_j$, is calculated as the actual share of sector-j in 1996 (obtained from Q-prod.com) multiplied by the total number of ISO-9000 in that period.

2. N_j is the total number of companies in sector-j in period-t.

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