

# Linking Index Analysis to Sectoral Trade Policy: A Case Study

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*Do Comparative Advantage indices capable of determining adjustment policies in sectoral trade? Changes in comparative advantage reflect changes in factor endowments directing to 'shifting trade policies'. Comparative advantage theory had evolved and been subject to different interpretations when extended beyond the classical trade theory. This paper calculates and compares the Revealed Comparative Advantage (RCA) of Bangladesh (a labor intensive country) and United States (a capital intensive country) in Clothing (both aggregated and disaggregated level) using the Balassa Index (BI) and the Michaely Index (MI) in the time period, 2001-2004 to check whether both the indices demonstrates the same trend or not. The paper further extended the Balassa interpretation defining four intervals of RCA to see whether the RCA could provide a closer insight in terms of strength or weaknesses at further levels of disaggregation in the selected time period. The empirical results, scrutinizing the definitions of data, provides a clear understanding to redesign trade policy instruments (in this paper, I offer a **Shifting Trade Policy (STP)**) in increasing export potentiality of particular commodities and maintaining sectoral balance.*

Field of Research: International Economics, International Trade Policy and WTO.

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## **I. Introduction:**

Bela Balassa (1965, p.116) stated: 'Comparative advantages appear to be the outcome of a number of factors, some measurable, others not...one wonders, therefore, whether more could be gained if, instead of, enunciating general principles and trying to apply these to explain actual trade flows, one took the observed pattern of trade as a point of departure.' Taking account of difficulties arising from actual measurement and comparison of all the factors influencing a country's comparative advantage, Bela Balassa came up with the Balassa Index or the Index of Revealed Comparative Advantage (RCA). Irrespective of Balassa's argument of defining the RCA approach of an industry's revealed trade pattern, the theoretical foundation of the concept had found to be less satisfactory (Svensson and Hamilton, 1984). They further argued that revealed comparative advantage is an exposition of the free trade pattern as the autarky price definition is not identical to the export pattern definition.

The measure of revealed comparative advantage, the Balassa index, is calculated as the ratio of the share of a given product in a country's exports to another country or region to the share of the same product in that country or region's total exports (Ferto and Hubbard, 2002). Vollrath (1991) offered three alternative specifications of revealed comparative advantage, following analyses of international competitiveness in agriculture. The first of these measures is the relative trade advantage (RTA), which accounts for imports as well as exports.

Ferto and Hubbard (2002) further identified problems of using these and similar indices, which depicts, in reality, observed trade patterns can be distorted by government policies and interventions, and the extent to which import restrictions, export subsidies and other protectionist policies might distort indices of revealed comparative advantage is therefore a concern.

The investigation of this paper is based upon the concept of revealed comparative advantage (RCA). The objective of this paper is of two-fold; firstly, it calculates and analyzes the revealed comparative advantage (RCA) of Bangladesh (a labor intensive country) and the United States (a capital intensive

country) in Clothing using the Balassa Index (BI) at both aggregated and disaggregated level, over the time period, 2001-2004. Secondly, it compares the Balassa Index results with the Michaely Index (MI) results (using the same data set), to examine whether both the indices demonstrates the same trend or not. A significant outcome of this research is to provide understandability to increase export competitiveness and maintaining sectoral balance at a disaggregated level.

The rest of the paper is organized as follows: the method and data are presented in Section II. The empirical results and interpretation are reported in Section III and Section IV contains some conclusions.

## **II. Data and Method**

Data has been collated from the International Trade Statistics Yearbook, 2004<sup>1</sup>, where data on Trade by Country / Region has been taken from Volume I and data on Trade by Commodity from Volume II. The International Trade Statistics Yearbook, 2004<sup>2</sup> provides information on articles of apparel and clothing accessories under SITC code 84 that has been used as aggregate data for clothing accessories in this paper. Data<sup>3</sup> on both aggregate (SITC 84) and disaggregate (SITC 841, 842, 843, 844, 845, 846 and 848) level on exports and imports for Bangladesh and the United States have been obtained from Volume I. The world totals of exports and imports at both aggregated and disaggregated level has been collected from volume II. The United States data at aggregated and disaggregated levels also includes data from Puerto Rico and US Virgin Islands as given in the data source. Aggregate data means using short number (in this paper, I refer to SITC 2 digit) in which many commodities are lumped together whereas disaggregate data involves a long commodity number (in this paper, I refer to SITC 3 digit) in which a very specific commodity is specified.

The following table shows the descriptions of different categories of clothing in SITC Code:

Table 1: Description of the Commodities used in SITC Code

SITC Code	Description of the Commodities
84	Articles of Apparel and Clothing accessories
841	Men's or boys' outerwear, of textile fabrics, not knitted or crocheted
842	Women's or girls' outerwear, of textile fabrics, not knitted or crocheted
843	Men's or boys' outerwear, of textile fabrics, knitted or crocheted
844	Women's or girls' outerwear, of textile fabrics, knitted or crocheted
845	Articles of Apparel, of textile fabrics, whether or not knitted/crocheted, nes
846	Clothing accessories, of textile fabrics, whether or not knitted or crocheted
848	Articles of Apparel, and clothing accessories not textile fabrics; headgear

Source: International Trade Statistics Yearbook, 2004.

Let  $X_{ij}$  and  $X_{it}$  denote country  $i$ 's ( $i = \text{Bangladesh and the US}$ ) export of product  $j$  ( $j = \text{clothing}$ ) and country  $i$ 's total exports respectively. Again, let  $X_{wj}$  and  $X_{wt}$  denote world exports of product  $j$  and world total exports respectively. The original RCA index, formulated by Balassa (1965), can be written as:

$BI_{ij} = (X_{ij} / X_{it}) / (X_{wj} / X_{wt})$  where,  $X_{ij}$ =value of country  $i$ 's export of product  $j$ ,  $X_{it}$ =country's total exports,  $X_{wj}$ =world exports of product  $j$  and  $X_{wt}$ =world total exports. Based upon the RCA approach, the measure ranges from 0 to  $\infty$ . The country in particular is said to have revealed comparative advantage in the product if the RCA Index exceeds unity; a value of less than unity implies that the country has a revealed comparative disadvantage in the product.

The usual interpretation of an RCA index is that it identifies the extent to which a country has comparative (dis)advantage in a product (Ferto and Hubbard, 2002). This paper has defined four intervals<sup>4</sup> of RCA to see whether the RCA could provide a closer insight in terms of strength or weaknesses at further disaggregated levels in the selected time period. The four intervals can be defined as: *very high* ( $RCA > 2$ ), *high* ( $2 > RCA > 1$ ), *low* ( $1 > RCA > 0.5$ ) and *very*

low (RCA < 0.5). The paper further showed relative ranking of the RCAs to make comparison of the results in different years under various product categories.

However, a wealth of literature prevails criticizing the measurement of RCA and therefore the issue of 'which index has got the best theoretical properties' remains. This paper, therefore, further measures the RCA using the Michaely Index, which incorporates the respective country's total imports in addition to total exports in the formula. The indicator was developed by Michael Michaely (1962/67), as an 'index of dissimilarity' for a country (Laursen, 1998).

Let  $X_{ij}$ ,  $M_{ij}$  denote the total value of exports and imports of sector  $i$  of country  $j$  and the Michaely index can be defined as:  $MI_{ij} = (X_{ij} / \sum X_{ij}) - (M_{ij} / \sum M_{ij})$ ; where the first part of the formula (before the minus sign) represents the percentage share of a given sector in country's exports and the second part represents the percentage share of a given sector in country's imports. As Laursen (1998) interprets, the measure ranges between -1 and +1, with a neutral value of 0. A positive index value denotes a country's specialization in a sector and a country's under-specialization in a sector while given a negative value.

### **III. Empirical Results and Interpretation**

The empirical results have been based upon two indices: the Balassa Index (BI) and the Michaely Index (MI). The Balassa Index results, as shown in table 2, reveal that Bangladesh has got comparative advantage in the product category SITC 84 (articles of apparel and clothing accessories in an aggregated form) during the period 2001-2004 whereas United States demonstrates comparative disadvantage in the same. This paper further defines the RCA of Bangladesh to be 'very high' (RCA>2) compare to be 'very low' (RCA<0.5) for the US in SITC 84.

Table 2: Balassa Index results in SITC Code-84

Year	Bangladesh	USA
2001	23.06267 (4)	0.295011 (1)
2002	23.22372 (3)	0.267164 (2)
2003	24.33001 (2)	0.242441 (3)
2004	26.05379 (1)	0.210303 (4)

*Source:* author's calculations.

Note: The numbers in the brackets shows the relative ranking of clothing export share compare to the world export in the respective year.

The SITC 3 digit level has also been analyzed to provide a deeper picture of a country's strength or weaknesses at a disaggregated level. Having examined for SITC 841, 842, 843, 844, 845, 846 and 848 during the period 2001-04 for both Bangladesh and the US, the Balassa Index, as shown in table 3, reveals varying numerical figures across the product categories.

Table 3: Balassa Index results for Bangladesh in SITC 3-Digit level

SITC Code	BI 2001	Rank	BI 2002	Rank	BI 2003	Rank	BI 2004	Rank
841	54.41183	1	54.81267	1	54.56222	1	41.84489	2
842	20.0657	2	19.29397	3	18.71804	3	12.7164	5
843	13.81743	4	12.83189	4	15.43646	4	57.57754	1
844	6.71843	5	6.802236	5	7.481774	5	15.13054	4
845	19.32319	3	21.92906	2	26.18233	2	34.72926	3
846	1.129936	7	0.577836	7	0.497208	7	4.417014	6
848	3.330836	6	3.104143	6	1.325113	6	2.798355	7

*Source:* author's calculations based on SITC data at the three-digit level.

Bangladesh has shown comparative advantage in all under SITC 3 digit been defined except vulnerability in SITC 846 during 2002-03. SITC 841,842,843,844,845 and 848 has been showing strong performance (RCA>2, very high) for Bangladesh. The ranking in SITC 3 digit commodities varies during the time period 2001-04 based upon the numerical figures of the Balassa Index results. The numbers also demonstrate the extent of the country's resource

utilization in exposing its revealed comparative advantage justifying the sector's strength in trade expansion<sup>5</sup>.

Conversely, different results have been drawn in the context of the US using the Balassa Index in this paper. A relatively better performance has been observed in SITC 846 (RCA>0.5, low) compare to the other SITC 3 digit commodities under investigation (RCA<0.5, very low).

Table 4: Balassa Index results for United States in SITC 3-Digit level

SITC Code	BI 2001	Rank	BI 2002	Rank	BI 2003	Rank	BI 2004	Rank
841	0.195629	6	0.180509	6	0.165348	6	0.131123	6
842	0.111066	7	0.098506	7	0.08595	7	0.084204	7
843	0.403922	2	0.353251	2	0.320984	2	0.252233	4
844	0.302277	5	0.252824	5	0.194969	5	0.191198	5
845	0.355762	3	0.33134	3	0.305841	3	0.258151	3
846	0.780313	1	0.728199	1	0.668123	1	0.583582	1
848	0.307514	4	0.273023	4	0.255808	4	0.281214	2

*Source:* author's calculations based on SITC data at the three-digit level.

The Michaely Index results are not found to be significantly different from what the Balassa Index has portrayed earlier. As shown in table 5, the index reveals specialization in SITC 84 for Bangladesh and under-specialization for the same for United States during the period 2001-04.

Table 5: Michaely Index results in SITC Code 84

Year	Bangladesh	USA
2001	0.726844(3)	-0.04667(2)
2002	0.736057(2)	-0.0468(3)
2003	0.720539(4)	-0.04696(4)
2004	0.75116(1)	-0.04347(1)

*Source:* author's calculations.

Note: The numbers in brackets shows the relative ranking in the respective year.

Following the computation in table 6 in SITC 3 digit commodities, Bangladesh is found to be specialized in SITC 841,842 845 and found to be under-specialized in SITC 846. On the contrary, under-specialization has been observed for the US in SITC 841, 842 and 845 as depicted in table 7.

Table 6: Michaely Index results for Bangladesh in SITC 3-Digit level

SITC Code	MI 2001	Rank	MI 2002	Rank	MI 2003	Rank	MI 2004	Rank
841	0.355519	1	0.338523	1	0.31431	1	0.216606	2
842	0.142664	3	0.141271	3	0.126187	3	0.081055	3
845	0.198446	2	0.223053	2	0.254151	2	0.316659	1
846	-0.0195	4	-0.01493	4	-0.01748	4	-0.00081	4

*Source:* author's calculations based on SITC data at the three-digit level.

Table 7: Michaely Index results for United States in SITC 3-Digit level

SITC Code	MI 2001	Rank	MI 2002	Rank	MI 2003	Rank	MI 2004	Rank
841	-0.00957	1	-0.00906	1	-0.00908	1	-0.00821	1
842	-0.01215	2	-0.01195	2	-0.0122	2	-0.01119	2
845	-0.01492	3	-0.01507	3	-0.0147	3	-0.01395	3

*Source:* author's calculations based on SITC data at the three-digit level.

Comparing the Balassa Index and Michaely Index results for 2 digit (aggregated level) SITC 84 and 3 digit (disaggregated level) SITC 841, 842, 843, 844, 845,848 during the period 2001-04 for both Bangladesh and the US, it turns out that the ranking of the commodities in terms of the RCA values do not seem to fluctuate considerably as opposed to expectations with respect to contextual challenges in the global trading system.

This paper further interpreted the Balassa RCA values defining four intervals to check whether the values could provide any closer insight in terms of strength or weaknesses at further levels of disaggregation in the selected time period. However, in the context of the Michaely index, which incorporates a country's total imports in addition to its total exports in the formula, the paper has followed its standard interpretations.

As been argued in existing trade literatures, the location of economic activities has found to be influenced by economic integration or trade liberalization. Bendavid-Val (1991) argued that the results of location quotient, which proves very much related to revealed comparative advantage mathematically as well as economically, have been heavily influenced by the degree of disaggregation of specialization variables, choice of the reference variable, choice of reference area, choice of years and the quality of data. This paper also attempts to identify the same trends of location quotient in the context of revealed comparative advantage using both the indices (Balassa and Michaely) for Bangladesh and the US in the selected years.

It has been observed that, based upon the degree of disaggregation, the results varies considerably. SITC 846 (clothing accessories, of textile fabrics, whether or not knitted or crocheted) shows comparative advantage in 2001 and 2004 and comparative disadvantage in 2002 and 2003 respectively despite SITC 84 (aggregated level) shows comparative advantage in the selected years for Bangladesh.

#### **IV. Conclusions**

The primary objective of this paper is to calculate and compare the revealed comparative advantage (RCA) of Bangladesh and United States in clothing (both aggregated and disaggregated level) using two indices (Balassa and Michaely) during the time period 2001-04 to identify whether both of them are following the same trend or not. The paper attempts to bring more plausibility in the Balassa Index results by illustrating an extended interpretation. For Bangladesh, the numerical figures in SITC 841, 842, 843, 845 are found to be significantly high compare to the remaining 3 digit commodities under investigation.

Based upon the empirical results and interpretation, the paper suggests some trade adjustment policies: i) A country looking for increasing the overall competitive edge of a particular sector could draw resources from the vulnerable and less competitive product categories and shift to the more competitive ones.

Here, I refer this to be a **Shifting Trade Policy (STP)**. This could help to maintain sustainability and even introducing new export potentials on a country basis in the long run. ii) **Sectoral balance** could possibly arise in the long run if resources are drawn from the commodities showing strong export performance towards the weaker ones under presence of some form of protective trade measures.

On the whole, based upon the computations using different formulae and interpretations of both the indices, this paper has identified some similar trends in the analysis of the end results. The interpretation of the RCA for both Bangladesh and United States provides a closer understanding to redesign trade policy instruments in increasing export potentiality of particular commodities and maintaining sectoral balance.

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<sup>1</sup> The International Trade Statistics Yearbook, 2004 is a globally accepted data source published by the United Nations. It converts time series data available in HS (Harmonized Commodity Description and Coding) into SITC (Standard International Trade Classification), which has been currently based on revision 3 and is expandable up to 5 Digits.

<sup>2</sup> The International Trade Statistics Yearbook, 2004 provides the definitions of data been used. Data shows the quantity and value in US Dollars of imports and exports. Export data and import data are given on FOB and CIF (in US Dollar) respectively. Regional totals are calculated only if the available partner detail exceeds 80% of the reported total imports or exports. Some lines for 2-, 3- and 4- digit commodity codes are omitted in cases where the line of the more detailed commodity code contains exactly the same information in terms of value and quantity for all four years shown (See International Trade Statistics Yearbook, 2004).

<sup>3</sup> Currency conversion factor remains as a useful check in most cases in the dataset. The conversion of values from national currencies to United States dollars has been done by means of currency conversion factors based on official exchange rates. These factors are applicable to total imports and exports respectively, but not necessarily to trade in individual commodities or with individual countries. Problems of *aggregation* in world total and some 3-digit or commodity totals are present due to estimation procedure. Problems of *overestimation of the 'true totals'* of the imports and exports also exists due to estimation procedure (See International Trade Statistics Yearbook, 2004 for a brief discussion on this point).

<sup>4</sup> See Li, Kui-Wai and Bender, Siegfried (March 2003).

<sup>5</sup> See Hoekman, Bernard M., Mattoo, A, and English, P. (2002).