

## **How Far Behind Are the South Asian Countries in Relation to East Asian Countries? Some Trade and Economic Development Considerations**

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### **Abstract:**

We define as South Asian countries those countries that start with Iran and end with Bangladesh in Asia. We then use export statistics in terms of revealed comparative advantage (RCA) for 14 industrial sectors to measure distances of export capabilities for these countries in relation to the “Western” developed and East Asian countries. Statistical methods such as multidimensional scaling and factor analysis are used for this purpose. In parallel, a set of economic variables are used to compare the trade performance with economic development.

The results are revealing for several reasons. First, although India is far ahead from the rest of the South Asian countries, all of them are still very behind in relation to both Western and East Asian countries. Exact distances are measured in this respect (distance from the leaders of exports and economic development performance). Second, most countries in South Asia are specialized in clothing, textiles, and leather, whereas several of them are specialized as well in resources. Third, it seems that the current economic boom in East Asian countries does not affect the economies of South Asia as much as expected.

In the light of these results, some policies are recommended in order to alleviate the relative setback of South Asian countries and in order for them to catch up with the other booming Asian countries.

**Keywords:** South Asian Countries, RCA.

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### 1. Introduction and Theoretical Background:

This paper attempts to measure development distances between South Asian and East Asian countries by also referring to all other countries in the world. It has become evident in the last 20 years or so that, with the relative exception of India, the South<sup>1</sup> Asian countries (starting from Iran in the West and ending with Bangladesh in the East; see also below in Table 6 for the exact inclusion of these 11 countries) are more and more lagging behind East Asian countries (which include South East Asian countries) in terms of economic and social development. In this paper we will concentrate our efforts in measuring such lag through the mirror of exports. In this introduction let us see some preliminary theoretical issues.

First, we will emphasize the “flying geese” pattern. Thus, for example, in North East Asia ‘the change in China’s export structure suggest that it has been following Korea in the “catching-up product cycle” development that began in Japan some years ago, and Korea itself had been following Japan’ (Kim *et al*, p. 382). As Kojima (2000, p. 376) remarks ‘the flying geese pattern of industrial development is transmitted from a lead goose (Japan) to follower geese (Newly Industrialized Economies (NIEs)<sup>2</sup>, ASEAN 4, China, etc)’. This pattern ensures that Korea will be for some time ahead of China on the formation of the flying geese at least in some industries and products. Also, within the ‘flying geese’ formation there are two opposing forces: first, there is a tendency for a similar structure of many industries and exports between the lead goose and the follower geese and amongst the follower geese themselves. However, the second force is to have some sort of ‘agreed specialization’ so that each economy specializes in different niche products and parts (Ibid, p. 394). Furthermore, ‘a characteristic feature of the ‘flying geese’ pattern in Asia has been the increasing role of TNCs; initially through non-equity arrangements and joint ventures and, more recently through FDI’ (Ibid, p. 389).

Ahearne *et al* (2003, p. 186) have re-affirmed

that ‘overall, the results are suggestive of a ‘flying geese’ pattern in which China and ASEAN-4 move into the product space vacated by the NIEs’. In particular when these authors examined the shares in US imports from China, they found that ‘China and ASEAN-4 appear to have been moving into the product space vacated by the NIEs’ (Ibid, p. 203). China and the emerging Asia seem to be both comrades and competitors; as these authors conclude: ‘...to the extent that China is displacing other economies in industries that the more advanced economies are moving out of, it is a healthy development with positive implications for the region’ (Ibid, p. 211). In addition, during the process of the ‘flying geese’ model Korea has soon become a direct competitor of Japan regarding exports. This is witnessed by several scholars, for example Kojima (2000, p. 394); Sohn and Lee (2005, p. 187 or p. 199).

Second, it is proposed that the “flying geese” process is also related to the importance of “leading sectors”. These sectors are very important in explaining economic growth. Effectively, Rostow (1962, 1990) has researched on the role of leading sectors in the economy and its stages of growth. Rostow (1962, p. 309) said:“...At any period of time, the rate of growth in the sectors will vary greatly; and it is possible to isolate empirically certain leading sectors, at early stages of their evolution, whose rapid rate of expansion plays an essential direct and indirect role in maintaining the overall momentum of the economy...” Hirschman’s (1958) theory of leading sectors complements Rostow’s contributions, in the sense that the micro and macro levels of the economy are linked together through backward and forward linkages.

The leading sectors in many countries (e.g. Great Britain, the USA, Japan), at the beginning of their development, or take-off, were the textiles and clothing and railway industries. The duration of their positive effect on the overall economy was about 50 years (Rostow, 1990). More recently, the leading sectors were the motor vehicles and electronics industries for Japan, and the chemicals and electronics industries for the USA. Rostow (1990) puts forward eight propositions, one of which is particularly related to leading sectors. He then states “...Schumpeter appeared to have in mind in his

<sup>1</sup>- This is a practical definition for the purpose of this paper and it does not fully follow standard geographical definitions.

<sup>2</sup>. Korea and Taiwan in this case.

*Theory of Development* a pioneering innovational breakthrough in a single major sector, followed by a strong bandwagon effect bringing into that sector a large number of new firms, with entrepreneurs of lesser breed, to exploit the demonstrated profitability of the innovation..." (p. 458). Rostow then mentions the time it took for some major industries in Britain to reign as leading sectors, which were about 40 to 80 years. For example, cotton textiles were a leading sector from the 1780s to the 1840s in that country.

Given this theoretical background on the development process of "flying geese" we intend to provide some quantitative evidence about it. For this purpose we will rank the largest 100 countries in the world according to their revealed comparative advantage (RCA) as calculated by the ITC for the year 2004. Various statistical methods (mainly 2-dimensional scaling and to a lesser extent factor analysis) will be used to reveal the international trade performance of each country vis-à-vis other countries and hence some groups will be suggested that show the position and location of each country in the globe. In particular, the position of South Asian countries such as Iran, India and Pakistan and their neighbours will be analysed. At the same time, theoretically through the statistical tools used, it will become apparent that the concept of RCA can still be useful in economic analysis. This paper picks up elements of Sanidas (2007) and extends it in the direction of the development catch-up process.

It remains to say a few words regarding RCA. Sanidas (2007) has briefly discussed the significance and use of RCA. Here we will only mention the formula based on Balassa's (1965) seminal paper:

$$RCA_j^A = (X_j^A / X^A) / (X_j^{Ref} / X^{Ref}) \quad (1)$$

where  $X_j^A$  is exports of sector  $j$  in country  $A$ ;  $X^A$  is total exports of country  $A$ ;  $X_j^{Ref}$  is exports of sector  $j$  of the reference countries (usually world); and  $X^{Ref}$  is total exports of the reference countries. The index  $RCA$  takes the values from zero to infinity and if it is greater than one, then the country  $A$  has a comparative advantage in producing and exporting products of the sector  $j$ . In this paper, we will use the ITC's official data on Balassa's RCA for the year 2004. We chose the largest

100 countries and considered all 14 industrial sectors<sup>3</sup> for which ITC has calculated the RCA index. In order to alleviate the problems mentioned in using the index itself (as in Sanidas, 2007), we used the ranking suggested by that index for each country and each major sector (and not the actual index of RCA). For the few missing data in some sectors and countries, we filled in the gaps by ranks that are greater than 100 (since the total number of countries used is 100).

Section 2 will briefly summarize the global distribution of the 14 industries as per RCA; Section 3 will present the quantitative findings based on the method of factor analysis; and Section 4 will discuss the results based on multidimensional scaling, and Section 5 concludes.

## 2. Geographical Distribution of Industries as per RCA:

Table 1 summarises the results for the 14 ITC industries in terms of ranking countries according to their RCA (only the first 45 ranks are reported). We can easily see in this Table the individual country's performance in terms of RCA. For example for the non-electronic machinery (number 10) European nations such as Italy, Austria, and Germany dominate the élite of this industry. Based on Table 1, Table 2 compares East Asian countries and South Asian countries in terms of the 14 sectors. There are substantial differences for all sectors between the 2 major regions but these differences are more accentuated for sectors 2, 4, 6, and 13, that is, all the advanced sectors (in which the South Asian countries lag very behind the East Asian countries). On the other hand, both regions have a strong presence in sectors 3, 5, 7, and 12.

<sup>3</sup>- See ITC site for full definitions of each sector (contained in 'The Trade Performance Index').

**Table 1. Summary of RCA ranks per industrial sector**

Basic manufacture	Chemicals	Clothing	Electric components	Fresh food	IT & consumer electronics	Leather Products	Minerals	Miscellaneous manufacturing	Non-electronic machinery	Processed food	Textiles	Transport equipment	Wood pr	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1 TAJIKISTA	3 SAUD ARABI	10 CAMBODIA	2 PHILIP PINES	4 ETHIOPIA	11 MALAYSIA	1 ALBANIA	1 ALGERIA	3 SWITZ.LIECH	2 ITALY	3 CUBA	2 PAKISTAN	1 SLOVAKIA	5 LATVIA	2
2 BHUTAN	4 IRELAND	3 BANGLADES	4 MALAYSIA	7 COTE D'IVOIR	13 HUNGARY	2 VIET NAM	3 NIGERIA	4 SLOVENIA	7 AUSTRIA	4 ARGENTINA	10 UZBEKISTAN	3 SPAIN	6 FINLAN	4
3 UKRAINE	5 SWITZ.LIEC	4 SRI LANKA	7 TAIWAN	8 BURJI FASO	14 CHINA	3 BOSNI HERZ	5 BOTSWANA	6 CHINA	9 JAPAN	5 NEW ZEALA	12 TURKMENS	4 JAPAN	7 MYANMAR	5
4 SO AFRIC	6 BELGIUM	5 MYANMAR	1 MOROCCO	0 PANAMA	16 COSTA RICA	5 MONGOLIA	6 CONGO	1 POLAND	0 GERMANY	6 BOLIVIA	13 TURKEY	6 CYPRUS	8 CENT.AFR.R	6
5 ARMENIA	8 BHUTAN	6 TUNICIA	2 JAPAN	1 AFGHANISTA	26 HOREA REP.	1 CAMBODIA	3 D.REP.CON	3 DENMARK	1 HUNGARY	7 CYPRUS	23 INDIA	7 CANADA	9 CAMEROON	7
6 CHILE	0 SENEGAL	7 ALBANIA	4 HOREA REP.	2 ZIMBABWE	27 PHILIP PINES	8 ETHIOPIA	0 BRUNEI DA	4 ESTONIA	2 SWITZ.LIECH	8 PERU	24 EGYPT	8 GERMANY	10 ESTONIA	8
7 KAZAHST	1 NETHERLAN	1 MOROCCO	3 THAILAND	3 UZBEKISTAN	29 THAILAND	9 TUNISIA	3 AZERBAIJA	5 COSTA RICA	3 SWEDEN	9 YUGOSLAVI	28 TAIWAN	9 FRANCE.MO	11 BOSNIA HER	10
8 YUGOSLA	1 FRANCE.MO	3 PAKISTAN	2 MEXICO	4 HENYA	33 IRELAND	0 PORTUGAL	4 IRAN-ISLAM	6 IRELAND	5 DENMARK	10 SAHAMAS	25 CHINA	10 HOREA REP.	14 SWEDEN	11
9 BOSNIA H	5 UNTD.JING	4 MONGOLIA	1 USA	5 ECUADOR	39 TAIWAN	1 BURJI FASO	1 VENEZUELA	7 BOSNIA HER	6 CZECH REP	11 BHUTAN	30 BANGLADES	12 SAHAMAS	15 CHILE	13
10 CHAD	1 SLOVENIA	4 TURKEY	4 TUNICIA	4 KYRGYZSTA	40 FINLAN	1 ITALY	9 OMAN	1 ITALY	7 UNTD.JINGD	13 SENEGAL	34 PORTUGAL	14 MEXICO	16 CANADA	14
11 PERU	7 GERMANY	6 BULGARIA	1 HUNGARY	1 ZEALAND	44 MEXICO	3 CHINA	8 SYRIAN A.R.	3 TAIWAN	8 USA	14 PANAMA	37 TAJIKISTAN	16 CZECH REP	17 NEW ZEALAN	16
12 BULGARIA	8 BELARUS	7 VIET NAM	8 SLOVENIA	8 TAJIKISTAN	45 NETHERLAND	1 YUGOSLAVIA	5 CENT.AFR.R	1 UNT ARAB	9 FINLAN	15 GRECE	38 HOREA REP.	17 POLAND	18 BHUTAN	17
13 ZIMBABW	9 ISRAEL	8 GRECE	1 CZECH REP	9 MYANMAR	48 ESTONIA	3 BULGARIA	1 CENT.AFR.R	2 AUSTRIA	0 FRANCE.MO	16 SPAZIL	36 BHUTAN	18 PORTUGAL	18 INDONESIA	18
14 SLOVAKIA	0 USA	9 CHINA	3 CHINA	0 CAMEROON	50 JAPAN	6 BRAZIL	2 TURKMENS	6 LITHUANIA	1 SLOVENIA	17 FASO	41 LATVIA	19 USA	20 PORTUGAL	19
15 RUSSIA	1 DENMARK	0 BOSNIA HER	1 PORTUGAL	1 SENEGAL	51 ISRAEL	8 BANGLADESH	1 NORWAY,S	7 UNTD.JINGD	1 POLAND	18 DENMARK	42 INDONESIA	20 BELGIUM	21 AUSTRIA	21
16 CZECH RE	1 YUGOSLAVI	1 LITHUANIA	1 GERMANY	1 COSTA RICA	54 UNTD.JINGD	1 CROATIA	1 RUSSIAN FED	1 CZECH REP	1 BOSNIA HER	21 ARMENIA	43 ITALY	21 SWEDEN	22 CONGO	25
17 TURKEY	1 SWEDEN	4 EGYPT	1 AUSTRIA	1 ARGENTINA	55 SWEDEN	0 PAKISTAN	1 KAZAHHSTA	1 MEXICO	22 CHILE	46 GRECE	23 CROATIA	23 LITHUANIA	23 LITHUANIA	26
18 GRECE	3 GRECE	3 PORTUGAL	1 COSTA RICA	3 CHILE	60 CZECH REP	1 INDIA	3 BOLIVIA	6 LATVIA	5 BRAZIL	23 DS	47 BELARUS	24 UNTD.JINGD	24 BRAZIL	28
19 EGYPT	8 SPAIN	6 INDIA	8 ISRAEL	6 COLOMBIA	62 USA	2 MOROCCO	1 ARMENIA	7 THAILAND	6 BELARUS	24 ECUADOR	48 LITHUANIA	25 TURKEY	26 DIVOIRE	30
20 SLOVENIA	1 INDIA	7 PERU	0 POLAND	1 BRAZIL	63 INDONESIA	3 ARGENTINA	2 MONGOLIA	8 JAPAN	7 SLOVAKIA	25 IRELAND	49 ESTONIA	27 SLOVENIA	27 POLAND	32
21 AUSTRIA	5 ITALY	1 CROATIA	1 SLOVAKIA	6 AUSTRALIA	64 DENMARK	8 KYRGYZSTAN	1 CAMEROON	0 NETHERLAND	6 TAIWAN	26 CROATIA	50 TUNICIA	28 AUSTRIA	28 CROATIA	33
23 LATVIA	0 HOREA REP.	3 KYRGYZSTA	4 LITHUANIA	0 MONGOLIA	67 PORTUGAL	9 INDONESIA	1 ECUADOR	2 SWENDEN	3 SOUTH AFRICA	28 COSTA RICA	53 CZECH REP	31 AFRICA	31 SLOVAKIA	41
24 BRAZIL	2 JAPAN	4 LATVIA	6 NETHERLAND	2 VIET NAM	68 FRANCE.MO	1 SPAIN	3 COLOMBIA	3 ISRAEL	2 SPAIN	29 AUSTRALIA	57 AFGHANISTA	32 ITALY	32 YUGOSLAVIA	42
25 UZBEKIST	3 COLOMBIA	3 YUGOSLAVIA	4 FRANCE.MO	3 SRI LANKA	73 UNTD ARAB	3 THAILAND	9 AUSTRALIA	4 SLOVAKIA	4 HOREA REP.	31 FRANCE.MO	60 SRI LANKA	33 HUNGARY	33 RUSSIAN FED	47
26 ITALY	1 TUNICIA	6 INDONESIA	0 IRELAND	4 SYRIAN A.R.	74 TURKEY	4 MYANMAR	4 ISRAEL	4 FRANCE.MO	5 BELGIUM	32 MALAYSIA	62 SYRIAN A.R.	34 BELARUS	34 BELARUS	48
27 FINLAN	1 CROATIA	3 TURKMENIST	1 TAN	2 ITALY	75 BELGIUM	3 ESTONIA	4 AFGHANIST	4 AF	6 VIET NAM	6 NETHERLAN	33 LITHUANIA	63 SLOVENIA	36 UZBEKISTAN	49
28 BELARUS	8 TAIWAN	8 PHILIP PINES	3 SWITZ.LIECH	8 DENMARK	78 AUSTRIA	3 NEW ZEALAND	4 EGYPT	4 CROATIA	8 THAILAND	34 UKRAINE	64 BELGIUM	37 OMAN	37 CZECH REP	50
29 INDIA	0 MOROCCO	9 ITALY	5 UNTD.JINGD	9 CUBA	79 POLAND	1 SLOVENIA	5 INDONESIA	9 INDIA	4 BULGARIA	35 THAILAND	65 ETHIOPIA	40 FINLAN	38 D.REP.CONG	52
30 SWEDEN	1 AUSTRIA	0 THAILAND	7 SWENDEN	1 EGYPT	80 SPAIN	6 AUSTRIA	6 PERU	0 HUNGARY	4 PORTUGAL	38 BELARUS	66 SPAIN	43 ESTONIA	39 MALAYSIA	53
31 TAIWAN	2 COSTA RICA	1 COSTA RICA	8 FINLAN	2 PERU	81 CANADA	9 HENYA	4 SAUDI ARABIA	1 CANADA	5 CROATIA	39 LATVIA	67 IRAN-ISLAM.R	44 AUSTRALIA	41 BULGARIA	54
32 SPAIN	3 EGYPT	2 COLOMBIA	9 BELARUS	4 CYPRUS	82 SLOVAKIA	1 EGYPT	8 CUBA	2 CYPRUS	6 CHINA	40 INDONESIA	68 CYPRUS	45 ARGENTINA	43 UKRAINE	55
33 AUSTRALI	1 BULGARIA	3 ESTONIA	0 BULGARIA	5 THAILAND	84 BRAZIL	2 COLOMBIA	9 LITHUANIA	3 MALAYSIA	7 TURKEY	41 SPAIN	69 SLOVAKIA	46 DS	45 GERMANY	57
34 ALBANIA	3 UKRAINE	4 MEXICO	1 ESTONIA	6 INDIA	85 LITHUANIA	3 BOLIVIA	1 BELARUS	5 BELARUS	8 YUGOSLAVI	42 MOROCCO	71 POLAND	47 NORWAY,S6,	46 ALBANIA	58
35 PORTUGA	6 POLAND	5 POLAND	2 INDONESIA	7 NETHERLAN	87 GRECE	4 SRI LANKA	3 SENEGAL	6 BELGIUM	9 UKRAINE	43 COLOMBIA	72 AUSTRIA	48 THAILAND	48 USA	59
36 GERMANY	4 SOUTH AFRICA	6 DENMARK	4 TURKEY	8 SPAIN	88 CROATIA	6 POLAND	5 KYRGYZST	7 YUGOSLAVIA	0 ISRAEL	44 BULGARIA	75 THAILAND	50 UKRAINE	49 BOLIVIA	60
37 NORWAY	9 CZECH REP	7 HUNGARY	6 KYRGYZSTAN	9 SAHAMAS	90 AUSTRALIA	7 ZIMBABWE	6 INDIA	8 SPAIN	1 ETHIOPIA	45 ZIMBABWE	76 AC	51 DENMARK	51 SPAIN	61
38 BELGIUM	1 LITHUANIA	8 SYRIAN A.R.	7 SPAIN	0 PAKISTAN	95 ITALY	9 HUNGARY	7 HENYA	9 PORTUGAL	2 GRECE	46 BELGIUM	77 VIET NAM	52 RUSSIAN FED	52 PANAMA	63
39 CROATIA	1 FINLAN	9 SLOVAKIA	6 VIET NAM	3 INDONESIA	97 SLOVENIA	1 BELARUS	8 CHAD	0 SAHAMAS	3 ESTONIA	47 PORTUGAL	78 ISRAEL	54 TAIWAN	53 AC	64
40 A VENEZUEL	3 ARGENTINA	0 ARMENIA	0 DENMARK	4 BOLIVIA	98 VIET NAM	3 SYRIAN A.R.	9 UKRAINE	1 HENYA	5 KYRGYZSTA	48 ESTONIA	81 COLOMBIA	57 PHILIP PINES	54 BELGIUM	65
41 ESTONIA	3 SAHAMAS	1 UKRAINE	2 GRECE	6 KAZAHHSTAN	99 CUBA	3 FRANCE.MO	6 SOU AFRICA	2 KYRGYZSTAN	6 UNTD ARAB	50 DIVOIRE	82 GERMANY	58 CHINA	55 DENMARK	66
42 COLOMBIA	1 CANADA	2 BELARUS	3 ZEALAND	7 TAN	1 NEW ZEALAN	6 PANAMA	1 VIET NAM	3 BULGARIA	7 NORWAY,S6,	51 AUSTRIA	83 CROATIA	59 ISRAEL	56 SWITZ.LIECH	67
43 FRANCE.M	1 THAILAND	3 TAJIKISTAN	4 BELGIUM	8 USA	10 SOUTH AFRICA	2 NORWAY,S6,	6 BELGIUM	2 ARGENTINA	5 NEW ZEALAND	52 ITALY	84 DENMARK	60 NEW ZEALAND	58 NETHERLAND	68
44 SWITZ.LIE	1 HUNGARY	4 CYPRUS	5 LATVIA	5 SOUTH AFRICA	10 CYPUS	1 UKRAINE	3 CANADA	5 BOLIVIA	9 INDIA	53 POLAND	86 PERU	61 SWITZ.LIECH	59 HUNGARY	69
45 HOREA R.	1 PORTUGAL	3 SLOVENIA	7 CANADA	9 YUGOSLAVIA	3 LATVIA	1 GRECE	8 CHILE	7 TURKEY	0 AUSTRALIA	55 TURKEY	87 USA	67 INDIA	60 COLOMBIA	71

Source: ITC.

Notes: Only the first 45 nations for each sector are shown here. The number next to each country is the original rank as calculated by ITC (the highest being about 180). The first column of the Table shows the absolute rank from 1 to 45.

**Table 2. Comparison between South and East Asia for the 14 RCA sectors**

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SA	4	1	7	1	9	0	5	6	3	2	0	9	2	0
EA	2	4	8	9	5	9	7	3	6	5	3	6	6	2

Source: based on Table 1, calculated by author.

Note: For the definition of sectors 1 to 14 see below the first column of Table 3.

World RCA maps for all 14 sectors were constructed (but not included in this paper), which show the 20 most competitive nations according to their RCA. Both Table 1 and these 14 maps show some of the most salient points of the present world distribution of international commerce in terms of RCA in exports. Table 3 further summarizes this distribution. Overall, it

becomes apparent that the first top 20 nations in terms of RCA ranks are situated predominantly in Europe, and to a lesser extent in East Asia, plus North America; this is the main reason why we get the results suggested by the factor and mapping analyses as discussed in subsequent sections.

**Table 3. Geographical distribution of the top 20 countries for each sector in terms of RCA scores**

Industry number	Industry name	North America	South America	Africa	Europe	Middle East	South Asia	East Asia	Total
1	Basic	0	2	4	11	0	3	0	20
2	Chemicals	1	0	1	14	2	2	0	20
3	Clothing	0	1	3	7	0	4	5	20
4	Electric components	2	1	2	7	1	0	7	20
5	Fresh food	0	7	7	0	0	5	1	20
6	IT and consumer electronics	2	1	0	8	1	0	8	20
7	Leather products	0	2	4	7	0	3	4	20
8	Minerals	0	2	6	2	6	2	2	20
9	Miscellaneous	2	1	0	13	0	0	4	20
10	Non-electric machinery	2	1	0	16	0	0	1	20
11	Processed food	2	7	3	4	2	1	1	20
12	Textiles	0	0	1	8	0	7	4	20
13	Transport equipment	4	0	0	14	0	0	2	20
14	Wood products	1	2	4	9	0	1	3	20

Source: based on Table 1, calculated by author.

Note: the definitions for South Asia and East Asia are those adopted in this paper.

Table 3 is also useful in another way: it tells us about the industrial sectors for which countries in specific geographical regions face fierce competition amongst themselves. Thus, in East Asia, there is substantial competition for 2-3 industries such as IT and consumer electronics, electric components, and to lesser extent miscellaneous products, whereas for South Asian countries, textiles and fresh food are the most competitive markets for them. On the other hand many European nations face a fierce competition in several

sectors, such as chemicals, non-electric machinery, and transport equipment. Overall, one could say –based on Table’s 3 figures- that economic development is mainly taking place in Europe and East Asia (as well as Northern America).

### 3. Quantitative Analysis,

#### Factor analysis:

Sanidas (2007) has used factor analysis to ascertain the importance of the 14 industrial sectors used by ITC in

relation to the RCA performance of the 100 countries examined. The principle component method is used to determine the most important latent variables (groups) out of the 14 initial industries. Eigenvalues greater than one, extracted four such groups explaining 72% of the total variance. The Kaiser-Meyer-Olkin measure of sampling adequacy is 0.79, suggesting a very satisfactory sampling representation. Similarly, Bartlett's test of sphericity is 800, which is excellent (0.000 significance). The rotated component matrix provides the following four groups (factors):

**F1:** chemicals, electronic components, IT and consumer electronics, miscellaneous, non-electronic machinery, and transport equipment.

**F2:** clothing, leather, and textile goods.

**F3:** basic manufactures, wood products, and minerals.

**F4:** fresh food, and processed food.

These results deserve some remarks. The observed variable "minerals" is rather isolated and has a very weak link with the third factor F3. The 4 factors show the degree of sophistication and high technology. Hence, the F1 group can be named the "advanced industries"; the F2 group is historically the first one to develop and grow, hence it can be named the "foundation industries"; the F3 group represents the "basic industries"; and the F4 group can be easily named the "food industries".

Also in Sanidas (2007) the factor scores for each country in terms of the four factors F1 to F4 were computed. Table 4 (at the end of this section) shows the results. For each factor, F1 to F4, the countries are put into an ascending order in terms of absolute factor score;

thus for example, for F1, Japan is the strongest in RCA as it has the most negative factor score (-2.04, hence the highest in absolute value), whereas for F2 Bangladesh is the strongest in RCA as it has the most negative factor score (-2.40), and so on. For F1, we have all the developed and developing countries in the top 40 positions, thus making the group of industries in F1 the moving force of world economic development. For the other three factors F1, F2, and F3, we have predominantly a mixture of developing and undeveloped countries.

Table 4 can also tell us which sector (via F1 to F4) is leading for each country at the beginning of the 21st century. Thus, for Bangladesh, Pakistan, China, Cambodia, Tunisia, Vietnam, and Sri Lanka, and others as seen in Table 4 under F2, the clothing, leather, and textiles sectors lead these countries into economic development. Developed and advanced nations such Japan, the USA, Ireland, and Germany (see Table 4 under F1) are driven forwards by the sectors of chemicals, electronic components, IT and consumer electronics, miscellaneous, non-electronic machinery, and transport equipment. Similar conclusions can be drawn for any other country in Table 4. Thus there is a noticeable difference between the South Asia and East Asia regions: for the group of advanced sectors of F1 there is no country of the South Asia region in the first 46 ranks as against 7 East Asian countries which are present in F1. For the other 3 groups F2, F3, and F4 the two regions are approximately equally represented as Table 5 shows.

**Table 4. South Asia and East Asia compared in terms of factors F1 to F4**

	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>
<b>South Asia countries</b>	0	8	2	3
<b>East Asia countries</b>	7	10	1	5

Source: Author

**Table 5. Factor analysis and hierarchy of sectors and countries for RCA scores**

Rank	Country	F1	Country	F2	Country	F3	Country	F4
1	JAPAN	-2.04	BANGLADESH	-2.40	BHUTAN	-2.21	BURKINA FASO	-2.31
2	USA	-1.77	PAKISTAN	-2.19	BOSNIA HERZG	-2.02	PANAMA	-2.30
3	IRELAND	-1.72	CHINA	-1.81	CHILE	-1.94	NEW ZEALAND	-2.13
4	GERMANY	-1.58	CAMBODIA	-1.79	YUGOSLAVIA	-1.72	ARGENTINA	-2.03
5	UNTD.KINGDOM	-1.53	TUNISIA	-1.69	RUSSIAN FED	-1.63	CUBA	-1.87
6	TAIWAN	-1.50	VIET NAM	-1.62	UKRAINE	-1.61	SENEGAL	-1.86
7	MEXICO	-1.47	SRI LANKA	-1.60	SOUTH AFRICA	-1.54	KENYA	-1.70
8	KOREA REP.	-1.45	ALBANIA	-1.60	LATVIA	-1.42	COSTA RICA	-1.67
9	HUNGARY	-1.43	BULGARIA	-1.50	BRAZIL	-1.41	COTE DIVOIRE	-1.55
10	ISRAEL	-1.43	BOSNIA HERZG	-1.49	AUSTRIA	-1.27	ECUADOR	-1.50
11	NETHERLANDS	-1.41	PORTUGAL	-1.48	SLOVAKIA	-1.23	BAHAMAS	-1.46
12	FRANCE,MONAC	-1.40	INDIA	-1.34	BELARUS	-1.22	CYPRUS	-1.29
13	CZECH REP	-1.32	MYANMAR	-1.29	BULGARIA	-1.19	CHILE	-1.28
14	THAILAND	-1.31	ITALY	-1.26	FINLAN	-1.17	BRAZIL	-1.25
15	SWITZ.LIECHT	-1.30	MOROCCO	-1.26	SLOVENIA	-1.12	BOLIVIA	-1.23
16	SWEDEN	-1.26	EGYPT	-1.25	SWEDEN	-1.08	ETHIOPIA	-1.23
17	DENMARK	-1.19	MONGOLIA	-1.21	POLAND	-1.04	DENMARK	-1.14
18	COSTA RICA	-1.17	TURKEY	-1.15	PORTUGAL	-0.99	IRELAND	-1.12
19	SLOVENIA	-1.15	ETHIOPIA	-1.00	PERU	-0.98	NETHERLANDS	-1.08
20	MALAYSIA	-1.08	GREECE	-0.89	CROATIA	-0.90	ZIMBABWE	-1.04
21	AUSTRIA	-1.06	INDONESIA	-0.87	ZIMBABWE	-0.90	YUGOSLAVIA	-1.01
22	PHILIPPINES	-1.04	YUGOSLAVIA	-0.79	CANADA	-0.87	AUSTRALIA	-0.98
23	CHINA	-1.04	TAJKISTAN	-0.77	ARMENIA	-0.86	MOROCCO	-0.86
24	POLAND	-1.02	ESTONIA	-0.77	ALBANIA	-0.81	PERU	-0.86
25	ITALY	-0.94	LATVIA	-0.76	ESTONIA	-0.80	GREECE	-0.84
26	FINLAN	-0.92	CROATIA	-0.73	CZECH REP	-0.80	COLOMBIA	-0.78
27	BELGIUM	-0.91	THAILAND	-0.71	NEW ZEALAND	-0.69	THAILAND	-0.69
28	SPAIN	-0.89	KYRGYZSTAN	-0.66	ITALY	-0.68	SPAIN	-0.58
29	CANADA	-0.78	SLOVENIA	-0.64	SPAIN	-0.60	KYRGYZSTAN	-0.54
30	SLOVAKIA	-0.77	SLOVAKIA	-0.64	BELGIUM	-0.56	FRANCE,MONAC	-0.43
31	ESTONIA	-0.75	TAIWAN	-0.56	CAMEROON	-0.55	BHUTAN	-0.36
32	CYPRUS	-0.68	LITHUANIA	-0.55	COLOMBIA	-0.55	MYANMAR	-0.35
33	PORTUGAL	-0.68	SYRIAN A.R.	-0.51	EGYPT	-0.54	INDONESIA	-0.30
34	CROATIA	-0.66	POLAND	-0.45	BOLIVIA	-0.53	CROATIA	-0.24
35	TURKEY	-0.55	BURKINA FASO	-0.43	KAZAKHSTAN	-0.52	AFGHANISTAN	-0.22

36	LITHUANIA	-0.53	COLOMBIA	-0.40	CHAD	-0.49	UKRAINE	-0.17
37	BELARUS	-0.52	TURKMENISTAN1	-0.40	NORWAY,SB,JM	-0.44	UZBEKISTAN	-0.15
38	BAHAMAS	-0.30	UZBEKISTAN	-0.34	ARGENTINA	-0.43	CAMEROON	-0.15
39	NEW ZEALAND	-0.21	SPAIN	-0.33	GREECE	-0.42	VIET NAM	-0.10
40	AUSTRALIA	-0.20	AUSTRIA	-0.30	GERMANY	-0.39	ESTONIA	-0.09
41	BRAZIL	-0.15	KOREA REP.	-0.30	INDONESIA	-0.38	LITHUANIA	-0.08
42	UNTD ARAB EM	-0.14	HUNGARY	-0.28	D.REP.CONGO	-0.37	MALAYSIA	-0.07
43	TUNISIA	-0.14	COSTA RICA	-0.21	AUSTRALIA	-0.36	USA	-0.03
44	GREECE	-0.13	BELARUS	-0.19	FRANCE,MONAC	-0.28	BELGIUM	-0.01
45	SOUTH AFRICA	-0.11	PHILIPPINES	-0.17	TAJKISTAN	-0.27	BULGARIA	0.04
46	SENEGAL	-0.11	PERU	-0.08	SWITZ.LIECHT	-0.25	SOUTH AFRICA	0.08

Source: Author

Note: Based on ITC RCA (ranks) figures, calculated by author, as per Sanidas (2007).

#### 4. The Results Based on Multidimensional Scaling:

This method will now be used to assess the 14 sectors groupings on a map; the results are shown in Figure 1. We observe on this map a flying geese formation for the 14 sectors in terms of RCA scores. The head of this formation consists of three leading sectors: IT and consumer electronics, non-electronic machinery, and transport. Further back we have textiles, basic manufactures, and wood; whereas much further behind we have clothing, and processed food, and finally at the queue we have fresh food and minerals. These results are as expected, and hence RCA ranks can be safely used to describe the hierarchy in factors of economic development such as industrial sectors. In addition, we can see that the F2 labour intensive industries are grouped together on the far north part of the map in Figure 1; the F1 sectors are concentrated on the east side of the map, and so on.

In a similar way, we will now map the countries in terms of RCA for 14 industrial sectors by using multidimensional scaling. The results with some brief statistical information are shown in Figure 2 where we can see that some very clear patterns are formed. Thus, the head of the whole formation on the map of this Figure is the south-western side with the most industrialized countries being congregated there: Germany, Japan, the USA, Switzerland, Sweden, and so on. Furthermore, the interpretation of the two dimensions can only be made by carefully observing the position of

countries and groups of countries on the map. Thus, dimension 1 can represent the degree of overall industrial advancement with most advanced countries on the west and the least advanced countries on the east side. This can be seen even more by referring to the 4 latent factors of industrial sectors as shown in Table 4 above. Accordingly, we can see that the factor F1 which contains the most advanced industrial sectors (such as IT, non-electronic machinery) is linked with the countries that are situated on the west side of the map; whereas F4 (food industries) represents countries that are overall situated on the east side of the map in Figure 2.

On the other hand, dimension 2 can represent the degree of industry specialization in terms of capital or labour intensity with F2 industries (the labour intensive ones) on the north and the more capital intensive industries on the south. Thus a combination of the two dimensions lead to the position of the most advanced countries in the world to be located on the south-west quadrant of the map; mineral (such as oil) rich but less advanced countries are situated on the east-south quadrant; and so on. Note that Figures 1 and 2 should be interpreted in a parallel way, as RCA indexes depend on both countries and industries included in their computation (see introduction). If we change the east horizon in Figure 1 (and keep the north-south direction the same) to west horizon then the F1 sectors in Figure 1 coincide with the countries in the west side of Figure 2 that are more specialized in these advanced F1 industries.



**Table 6. Distances in relation to Japan on the map of RCA**

SA	India	Uzbek/n	Turkm/n	Kazak/n	Paki/n	Tajik/n	Bangla/sh	Sri Lanka	Afgan/n	Kyrz/n	Iran
SA	3.5	5.4	6	6.5	6.6	6.6	6.8	6.9	6.9	7	7.1
EA	Japan	Korea	Taiwan	Philip/nes	Thailand	Malaysia	China	Indonesia	Camb/a	Vietnam	Mongolia
EA	0	0.5	1.4	3	3.3	3.3	3.4	4.1	5.9	6.4	7.3

*Source:* Author

Note: The second and fourth rows show distances in cm in relation to the position of Japan (as per Figure 2).

Regarding the East Asian countries, we can see that only Japan is inside the group of the most advanced countries. Korea is also quite close to this group and Taiwan following Korea; then further away we get the Philippines, Thailand, Malaysia, and China; even further away we have Indonesia, and finally Vietnam followed by Mongolia. For South Asia region, India is the closest to the advanced countries and all other countries in this region are much more distanced from India. Table 6 shows the distances from Japan (as actually measured on the map with a ruler<sup>4</sup>).

It is revealing to notice that the shape of the countries on the map according to their RCA (in Figure 2) looks like a flying geese flock. Its head consists of countries like Japan, the Czech republic, Korea, Germany, Sweden, the USA, and others around them; whereas the back part of the flying geese flock is much wider and comprises countries like Ethiopia, Cambodia, Mongolia, Cameroon, Iran, Algeria, Nigeria, and so on (and countries around them). Furthermore, Table 6 shows us the exact relative distances of the countries of South Asia and East Asia regions in relation to one of the leaders of the flock, that is, Japan. The important point to stress here is that the formation of flying geese flock is the consequence of each country's RCA. Nonetheless, it must be noted that RCA and international trade show only partly each country's position on the ladder of economic development. For example, although China is almost in front of the flying geese flock (from the x-axis

viewpoint) its economic development is not evenly spread throughout the nation; the same can be said about India.

So far we have provided evidence that the RCA ranks are a good tool for comparisons of international trade. Could we also infer that RCA ranks are a good tool for comparisons of economic development? This obviously hints at the well-known relationship between international trade and economic development. To answer this question we considered 9 economic variables<sup>5</sup> (average annual % growth of GDP; value added of manufacturing industry as % of GDP; gross capital formation as % of GDP; external balance of goods and services as % of GDP; manufactured exports as % of total merchandise exports; high technology exports as % of manufactured exports; PPP Gross National Income per capita in US\$; value added of agriculture as % of GDP; and agricultural value added per worker) and mapped 89 countries (89 out of the 100 countries in Figure 2, for which data were readily available) according to the 2-dimensional scaling method. The results are shown in Figure 3 (placed at the end of the paper). It is apparent –when comparing Figures 2 and 3- that the pattern of relative distances between the included countries is quite similar. Japan again is the closest East Asian country to the leaders of economic development (USA, UK, Sweden, Germany and others). Table 7 shows the measured distance from Japan of all other East Asian and South Asian countries.

<sup>4</sup>- These distances can also be measured (more accurately) by using the exact coordinates for each country on the map as produced by the method of multidimensional scaling.

<sup>5</sup>- The source of these data is World Bank internet site.

Approximately the relative distances are almost identical (between the two mappings of the 9 economic variables set and the RCA scores set). Hence we can say that RCA ranks and the 9 economic variables<sup>6</sup> set are forming the same flying geese pattern at the beginning of the 21st century. Note that economic development for most South Asian countries lags behind their trade performance (in terms of RCA scores), however the relative positioning of all countries examined is approximately the same for both the economic development map and the exports RCA scores map. This similarity confirms the theoretical close link between economic development and international trade.

### 5- Conclusions:

In this paper we used the ITC calculations for RCA in relation to 14 major industrial<sup>7</sup> sectors and the largest 100 countries in the world (thus we excluded countries like Singapore which re-export a substantial part of their total exports and other small countries population-wise). We used statistical techniques such as factor analysis and multidimensional scaling to draw some conclusions. First, we determined the leading sectors and groups of sectors that lead national economies to economic development. Thus, China is lead by clothing, leather, and textiles, although the advanced sectors are also contributing substantially. The situation is reversed for Korea which is lead by the advanced industries (represented by factor F1 in the factor analysis). For the South Asia region, we can certainly say that this region lags behind the East Asia region and only clothing, textiles and fresh food are the leading sectors of South Asia region countries. Secondly, we uncovered the 'flying geese formation' of this development according

to RCA. The head of this formation is a group of technologically advanced nations such as Japan, the USA, Germany, Austria, Switzerland, Korea, Taiwan, and others. China and Thailand are further behind followed by Malaysia and the Philippines, and even more behind are Vietnam and Indonesia. For the South Asia region, India is the closest to the most advanced group and hence to Japan, approximately at the same distance as China is from Japan.

Third, these relative distances of trade (exports) development (via the use of RCA ranks) are measured in this paper through the method of multidimensional scaling (for the East Asian and South Asian countries). Thus, if Japan is at the 100% level (in terms of trade RCA) then Korea is at about 90-95% level, Taiwan is at approximately the 80% level, Philippines, China, Thailand, India, and Malaysia at the 55-60% level, Vietnam, Pakistan, Kazakhstan at approximately the 15% level, and so on<sup>8</sup>. It would be a very interesting exercise to repeat these measures in about 5 years time to see changes in these relative distances.

Fourth, within the East Asia region, Japan leads the development relying entirely on the factor F1 of advanced industries; whereas within the South Asia region, the four sub-continent countries Pakistan, Bangladesh, India, and Sri Lanka lead the development relying mainly on the factor F2. Fifth, for the sectors of electric components, IT & consumer electronics, and to a lesser extent miscellaneous manufacturing, competition in East Asia is very strong. All these results are not surprising and confirm that the usage of RCA is safe and promising in economic analysis. Sixth we used a set of 9 economic variables and found a very close relationship between the mapping of this set for 89 countries and the mapping of the same countries in terms of RCA ranks, thus providing evidence to the well known links between

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<sup>6</sup>- A factor analysis on these 9 economic variables groups GNI per capita, % of agricultural value added, and agricultural productivity together as G1; % of manufacturing value added and external balance together as G2; annual growth of GDP and % of GCF together as G3; and the remaining as G4.

<sup>7</sup>- Hence services are not taken into account; this might be a source of bias in the foregoing analysis but cannot be verified in this paper.

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<sup>8</sup>- These figures are based on Table 6 of the text.

trade development and overall economic development. Also, a similar pattern as for RCA is found for the relative distances between East Asian as well as South

Asian countries regarding their economic development as represented by these 9 economic variables.

**Table 7. Distances in relation to Japan on the map of economic development**

SA	India	Uzbek/n	Turkm/n	Kazak/n	Paki/n	Tajik/n	Bangla/sh	Sri Lanka		Kyrz/n	Iran
SA	6	16.9	15.7	12.6	5.3	15.4	5.5	5.8		8.4	13
EA	Japan	Korea		Philip/nes	Thailand	Malaysia	China	Indonesia	Camb/a	Vietnam	Mongolia
EA	0	2.3		4	4.8	3.3	4.8	6.3	6	8.5	10

Source: Author

Note: The second and fourth rows show distances in cm in relation to the position of Japan (as per Figure 3). Also it is important to stress that the distances (in cm) are not directly comparable with the distances shown in Table 5 for RCA scores.

Seventh, despite the current economic boom in East Asia for the last 15 years approximately, South Asian countries do not seem to have participated in or being positively affected by this boom. More research is needed in order to assess the links between the two regions but it is apparent that factors of economic growth such as foreign direct investment, GDP growth rates, and exports of industrial goods are lagging behind in the South Asia region in relation to East Asia and other regions of the globe.

Given these overall conclusions what can we recommend for a reversal of the current trend in South Asia? First, it seems evident that economic integration between the nations of South Asia should be pursued in a more active way than it is presently taking place. Secondly, the two regions could be more integrated by signing free trade agreements between countries of the two regions. Third, it is also evident that India should enhance its economic relations with China because these two giants will contribute more and more to the overall economic development of the Asian continent and to the whole world. Fourth, internal socio-economic policies in each South Asian country are very important in enhancing the process of regional economic integration.

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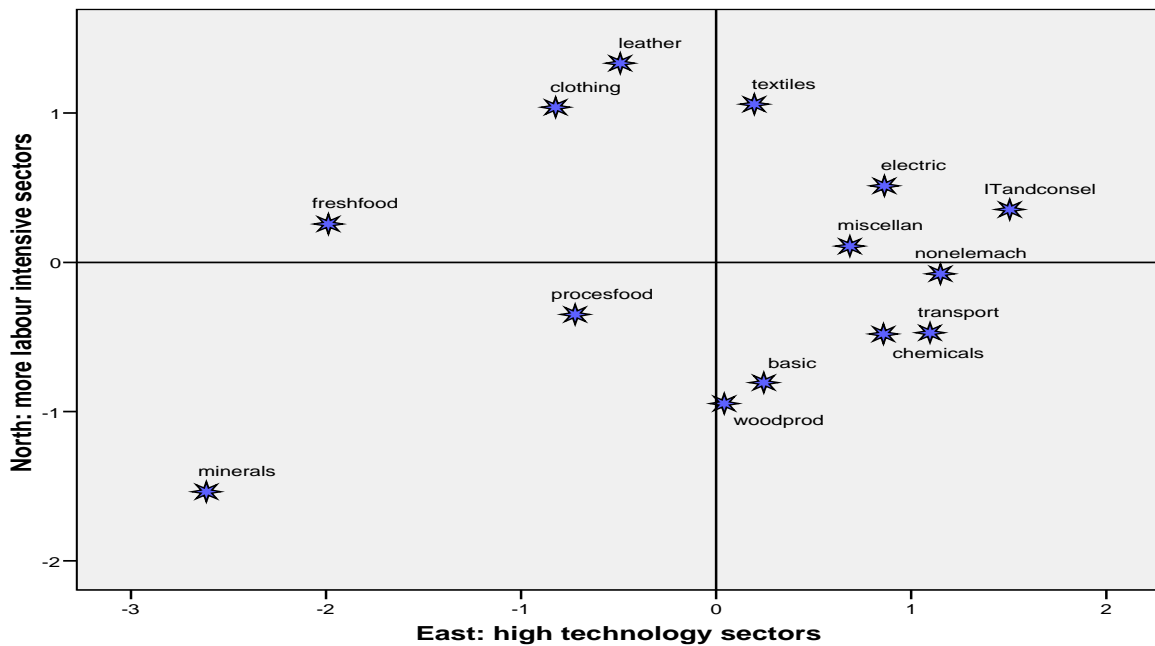


Figure 1. Map of the flying geese formation of industrial sectors.

Notes: The type of distance used is “block city” with “maximum magnitude of 1” as standardization. The “stress” is 0.105 and the RSQ = 0.95.

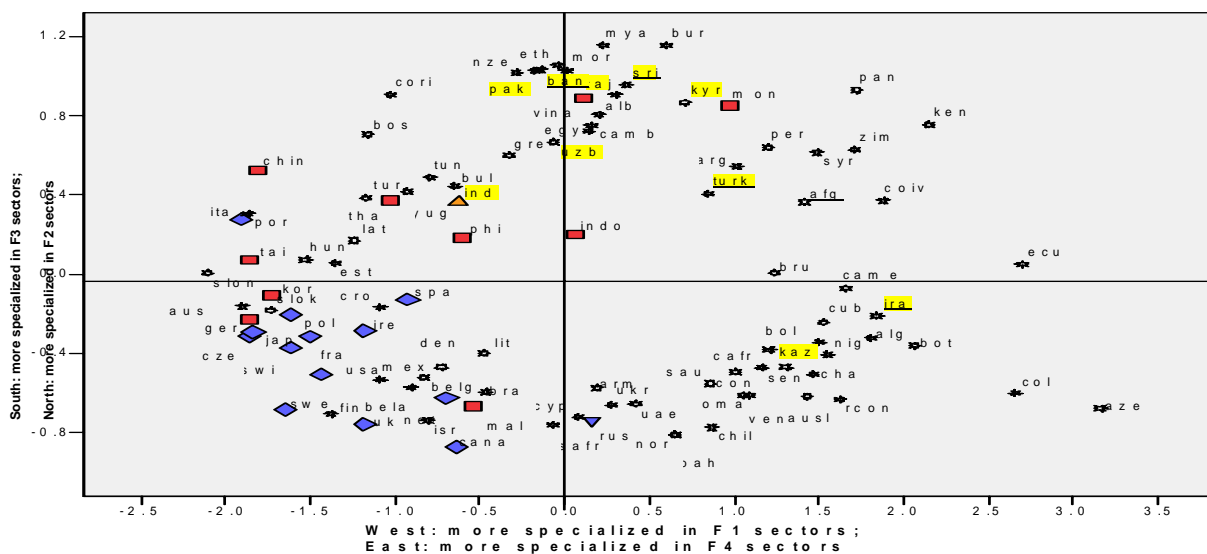
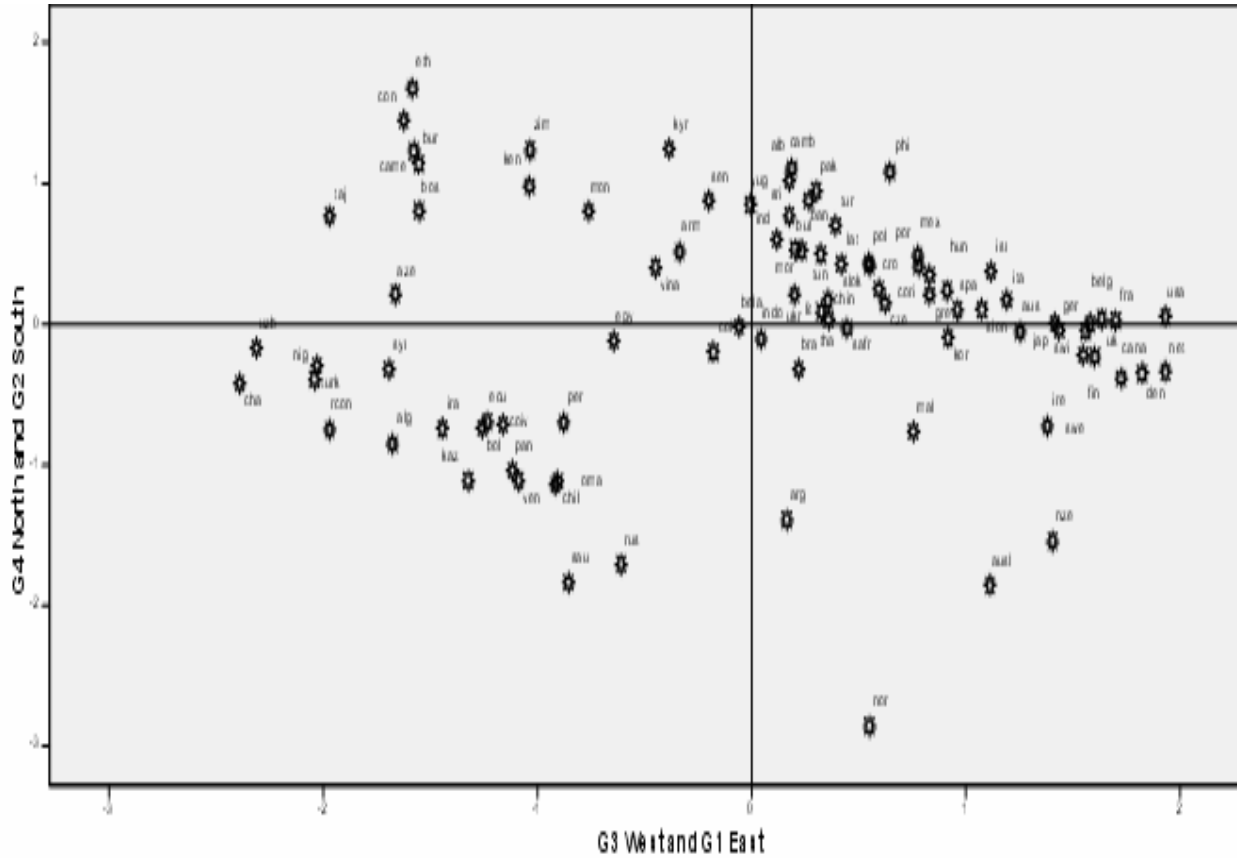


Figure 2. Map of RCA: 2-dimensional scaling for 100 countries.

Notes: for better visual observation, East Asian countries are shown as squares, “Western” countries as rhomboid; India or Russia as triangles; South Asian countries are highlighted in yellow (thus a bit darker on the map) and underlined. The type of distance used is “city-block” (see Hair et al, 2006, p. 575 for definition) and standard deviations of 1 as standardization. The equivalent squared correlation (RSQ) is 86.4% and the “stress” is 0.178 which are statistically satisfactory. Only 2 dimensions are found to be significant.



**Figure 3. Map of economic development for 89 countries and 9 economic variables**

Notes: (i) The type of distance used is “city-block” (see Hair et al, 2006, p. 575 for definition) and standard deviations of 1 as standardization. The equivalent squared correlation (RSQ) is 92.8% and the “stress” is 0.129 which are statistically satisfactory. Only 2 dimensions are found to be significant. (ii) The dimensions I and II (x-axis and y-axis) are found to be related to the latent factors G1, G2, G3, and G4 as indicated by factor analysis conducted on the 9 economic variables (see text regarding Table 7 comments) and the 89 countries. (iii) In relation to the map of RCA (see Figure 2) no data were readily available for the 11 missing countries in this Figure.