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Trade Integration and Revealed Comparative Advantages of Sub-Saharan Africa and South Asian Merchandize Export

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Hailay Gebretinsae Beyene

Abstract

Policy issues related to trade are influenced through research outputs that draw on the concept of comparative advantage of nations/regions. The facilitation of economic integration in a region is influenced with the prevailing reality of comparative advantage of a country or region. This article investigates the revealed comparative advantages (RCAs) of sub-Saharan Africa and South Asia on the export of merchandise subsectors (Food, Agricultural Raw Materials, Fuels, Ores and Metals and Manufactures) for the period 1995–2010. The study has used RCA indices, and examined the regions' trade share in the world in relation to their respective population sizes.

The study reveals that trade in the world is skewed towards the high-income economies limiting economic integration of sub-Saharan Africa and South Asia regions with the world. Sub-Saharan Africa has RCAs on Food, Agricultural Raw Materials, Fuels, Ores and Metals export. South Asia has shown a change from RCA to comparative advantage position in export of Ores and Metals. Sub-Saharan Africa has *very high* competitive position in four of the five subsectors, while South Asia has improved from three to four subsectors in *high* competitive position. Interestingly, the study reveals that both regions have lower competitive position in manufactured goods export. Sub-Saharan Africa's revealed competitive position is stronger than South Asia in merchandise export except in manufactured goods.

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Introduction

The theory of comparative advantage asserts that the basic reason for countries to make trade is the relative cost difference on production of goods and services between them. Countries with relative advantage in the production of a good are supposed to produce it in surplus and export to other countries with relative disadvantage in production of the good. This trade relationship makes them gain than under autarky. The size of gain from trade is directly related to the size of comparative differences.

The proponent of the theory of comparative advantage, Ricardo (1817), stated that absolute production cost difference rather than comparative cost difference is the reason for international trade. Thus, even if a country has absolute advantage in the production of goods, it can gain by importing the relative dearer good and exporting the relative cheaper good (Deardorff, 2011).

The theory's influence has been strong especially after World War II where international organizations such as the then GATT and now the WTO were established to promote free trade in the world. However, the relevance and adequacy of the theory in explaining international trade of current world is posing questions. Basically, this theory underlies its argument on available domestic resources. Currently, significant resources are mobile across borders and information and communication technology era influence the productivity of a country and trade pattern of the world (Kowalski, 2011). In addition, studies made by OECD (2009) and Kowalski and Cepeda (2011) argue that the theory of comparative advantage, traditional model, does not explain the existing trade pattern adequately.

Many economists in the post-Ricardo phase gave more importance to technological and human factors while Ricardo's emphasis was on physical and natural factors. The theory of comparative advantage has been extended via Mill and Marshall to Heckscher, Ohlin and Samuelson. Heckscher and Ohlin assumed factors of production are immobile and countries utilize it in different intensities, thereby, relatively endowed country uses more intensively (Goldin, 1990).

The validity of Heckscher and Ohlin model has been examined and revealed as Leontief paradox. The USA export industries are found to be largely labour intensive, whereas the import-competing industries are largely capital intensive. This was based on the finding that exports of the USA embodied higher ratio of labour to capital inputs than its imports.

However, in contrast to Leontief's paradox, Harkness (1975) and Kenen (1965) revealed that the factor endowment hypothesis is applicable for the trade of the USA, Canada, West German and Japanese. In their study, they differentiated skill levels and used three factor models, human capital, physical capital and raw labour. Krugman (1990) finds that the theory is inadequate to explain the pattern of world trade.

Literature Review

Theoretically, comparative advantages are expressed in relative prices evaluated in the absence of trade. However, due to absence of data on relative prices they cannot be observed. To fill this gap indirect method of measuring is devised by Balassa (1965) and the model is used only for export. Balassa has transformed RCA several times as studies on RCA show (Balassa, 1977, 1979, 1986).

Bhattacharyya (2011) applying RCA has done a study on vegetable, fruit and flower trade in Asia, the EU and North America (the USA and Canada). It has been discovered that India has significantly higher comparative advantage in vegetable and fruit markets but not in flower.

Batra and Khan (2005) study on the RCA of India and China found variation on the pattern of comparative advantage depending on the levels of commodity disaggregation. In the case of India, except cotton no sector is in the list of top ten. Moreover, their study revealed that while either country is on disadvantageous position at aggregate level, it has comparative advantage at constituent commodity level. China and India have advantageous position in science-based manufactures. India dominates in medicinal and pharmaceutical products, whereas China dominates in photographic apparatus, equipment and optical goods category. Moreover, in leading science-based commodity category, China has more than double of India's comparative advantage.

Anthony and Hasson (2012) revealed that despite the existence of significant proportion of unskilled people and massive unemployment, paradoxically, South Africa has revealed comparative advantage (RCA) in capital intensive products. In a study on comparative advantage and economic performance of East African Community (EAC) member states, Chingarande et al. (2013) disclosed that states have RCA in narrow product range, involved in production of similar products that restricts economic integration through intra-regional trade.

A transformation process of the agricultural sector during 1962–2008 has been examined. Diversification and specialization trends have been observed in the overall economy and sectoral level. Africa's economic transformation is primarily characterized by enhanced diversification in non-agricultural exports. Despite modest specialization and sophistication on products, diversification in agricultural sector is insignificant (Ulimwengu and Badibanga, 2012).

The literature review indicates that no studies are undertaken so far that examine RCA of the African continent and South Asia. Several studies explored the RCA of a nation in relation to other countries and regions. However, comparative analysis of African continent's comparative advantage in relation to South Asia is unexplored area this study has dealt. In addition, this study attempted to examine the RCAs with respect to broad product categories of merchandise trade that have major policy implication for economic integration of the regions. The merchandise trade includes subsectors: Food Export, Agricultural Raw Materials Export, Fuels Export, Ores and Metals Export and Manufactures Export of the two regions.

Conceptual Framework of the Study

To examine the RCA of both regions, the study has used the commonly used tool of Balassa (1965). RCA method has enabled to evaluate the extent of comparative advantage on the specified subsectors of the two regions. This indicates the potential for economic integration of the regions. The formula for RCA, specifically used for this study is described as follows.

$$RCA = \left[\frac{\left(X_{ij} \middle/ \sum_i X_{ij} \right)}{\left(\sum_j X_{ij} \middle/ \sum_j \sum_i X_{ij} \right)} \right]$$

Where,

X_{ij} signifies exports of sector 'i' at region (sub-Saharan Africa or South Asia) 'j',

$\sum_i X_{ij}$ signifies total exports of region 'j',

$\sum_j X_{ij}$ signifies 'world' exports of sector 'i', (sum of countries sector's 'i' exports),

$\sum_j \sum_i X_{ij}$ signifies total 'world' exports.

The RCA index values range between zero (0) and positive infinitive (+∞). If the calculated RCA value of a country exceeds unity, the country has RCA in the sector.

Data and Methodology

The application of RCA indices has the advantage that it considers the intrinsic endowment of a particular region of the specified subsectors of merchandise export. Moreover, to compare the values of RCA of the two regions, differential value that measures the variance or strength of the two regions is considered. To capture these values, the following equation is set.

$$RDRCA \text{ (SSA and SA)} = RCA_{SSA} - RCA_{SA}$$

Where,

RDCA refers to revealed difference in RCA of the sub-Saharan Africa and the South Asia

SSA refers to the sub-Saharan Africa and

SA refers to the South Asia.

This is expressed in an expanded equation form as given below.

$$RDCA = \left[\frac{\left(X_{ij} \middle/ \sum_i X_{ij} \right)}{\left(\sum_j X_{ij} \middle/ \sum_j \sum_i X_{ij} \right)} \right] SSA - \left[\frac{\left(X_{ij} \middle/ \sum_i X_{ij} \right)}{\left(\sum_j X_{ij} \middle/ \sum_j \sum_i X_{ij} \right)} \right] SA$$

However, RCA's limitation is that it does not consider possible improvements in factor endowments in the regions and design and implementation of appropriate economic and trade policies in the region as a whole and countries in particular of each region. To supplement the analysis of RCA of the regions, their share in the world trade in relation to their population size is examined. Secondary data are collected from various issues of World Development Indicators (WDI) published by the World Bank.

Finding and Analysis

Summary of statistics of population proportion in the world as grouped into *low- and middle-income, high-income economies* and corresponding regions within the low- and middle-income category are shown in Table 1. The overwhelming majority of world population that accounts for more than 80 per cent is in the low- and middle-income economies, while the rest minority is in the high-income economies. The trend in the past two decades shows that the size of population who live in low- and middle-income category did not show significant change. There is a wide economic disparity across the world. With regard to the subcategories under low- and middle-income group, in 1990 the proportion of population living in South Asia and sub-Saharan Africa accounts to 21.38 and 9.75 per cent respectively. The population proportion of South Asia and Sub-Saharan Africa in the world has grown to 23.69 and 12.38 per cent respectively in 2010.

Table 1. Percentage of World Economic Regions Population During 1990–2010

Economic Region	1990	2000	2003	2004	2005	2006	2008	2009	2010
Low & middle income	81.43	82.84	84.50	84.22	84.30	84.24	84.04	83.52	83.65
East Asia & Pacific	30.30	29.65	29.57	29.37	29.29	29.04	28.81	28.69	28.45
Europe & Central Asia	7.43	6.51	7.53	7.42	7.33	7.04	6.62	5.97	5.88
Latin America & Caribbean	8.25	8.41	8.49	8.58	8.56	8.51	8.45	8.45	8.45
Middle East & North Africa	4.31	4.53	4.97	4.72	4.75	4.75	4.86	4.88	4.81
South Asia	21.38	22.85	22.71	22.73	22.83	22.93	23.07	23.14	23.69
Sub-Saharan Africa	9.75	10.89	11.23	11.40	11.54	11.96	12.23	12.39	12.38
High income	18.57	17.16	15.50	15.78	15.70	15.76	15.96	16.48	16.35
World	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author's computation based on WDI data.

Table 2. Population and Trade Share of Sub-Saharan Africa, South Asia, Low and Middle Income and High Income Economies During 2005 and 2010

	Percentage in World Population	Percentage in World Trade	Percentage in World Population	Percentage in World Trade
Economic Region	2005		2010	
Sub-Saharan Africa	11.54	1.5	12.38	1.8
South Asia	22.93	1.5	23.69	2.9
Low & middle income	84.3	24.5	83.65	29.7
High income	15.7	75.5	16.35	68.5

Source: Author's computation based on WDI data.

It is shown in Table 2 that population proportion of sub-Saharan Africa in the world that accounts for 11.54 per cent in 2005 has low trade share in the world which accounts to 1.5 per cent of the world trade. Similarly, population proportion of South Asia in the world that accounts for 22.93 per cent in 2005 has low trade share in the world which accounts to 1.5 per cent. In 2010, population proportion of the sub-Saharan Africa in the world has increased by 0.84 percentage points and has become 12.38 per cent, whereas its trade share in the world has increased by 0.3 percentage point and become 1.8 per cent. Likewise, in the same year, 2010, population proportion of South Asia in the world has increased by 0.76 percentage point and has become 23.69 per cent, whereas its trade share in the world has increased by about one-fold reaching to 2.9 per cent.

Therefore, it can be inferred that the trade share of sub-Saharan Africa and South Asia regions is very low as compared to their population share in the world. Despite each region exhibited modest rise in its trade share, it is low in relation to their population size. Trade in the world is lopsided and skewed towards high-income economies. It can be summarized that more than 70 per cent of world trade is undertaken among the high-income economies. The remaining 30 per cent of world trade is undertaken with the vast majority of world population. Hence, while economic integration is very strong among the few and small population-sized economies of the world, it is very low with the rest of low- and middle-income economies.

It is portrayed in Table 3 and Figure 1 that both sub-Saharan Africa and South Asia have RCA in the subsector *Food export* of merchandise sector. However, the strength of comparative advantage of each region has decreased. In general, the trends of RCAs of the two regions have exhibited an up and down trend with more of decline. Comparatively, sub-Saharan Africa has higher RCA in Food export than South Asia during 1995 to 2010. The gap in comparative advantage between the two regions is featured by widening trend during 1995–2004 and more of squeezing trend afterwards.

Table 3. Revealed Comparative Advantage of Sub-Saharan Africa and South Asia

Year	(A) Food Export		(B) Agricultural Raw Materials Export		(C) Fuels Export		(D) Ores and Metals Export		(E) Manufactures Export	
	Sub-Saharan Africa	South Asia	Sub-Saharan Africa	South Asia	Sub-Saharan Africa	South Asia	Sub-Saharan Africa	South Asia	Sub-Saharan Africa	South Asia
1995	2.00	1.89	2.33	0.67	5.14	0.14	2.67	1.00	0.37	1.00
2000	2.14	1.71	2.50	1.00	3.70	0.30	2.33	0.67	0.41	1.07
2004	2.29	1.57	2.50	0.50	4.75	0.75	3.33	1.67	0.40	0.99
2006	2.14	1.83	2.50	1.00	3.60	0.82	3.33	1.50	0.44	0.99
2008	1.75	1.63	1.50	1.00	3.00	1.17	4.00	1.25	0.46	0.93
2010	1.88	1.50	2.00	1.00	2.67	1.08	3.60	1.20	0.45	0.96

Source: Author's computation based on WDI data.
Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity (0 ≤ *RCA* < 1) reveal comparative disadvantage.
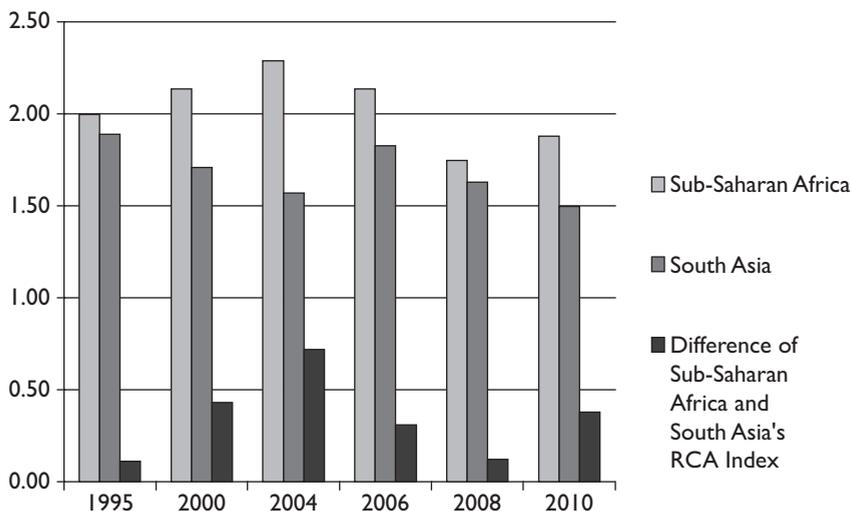
Figure 1. RCA of Food Export of Sub-Saharan Africa and South Asia and RDCA
Source: Author's computation based on WDI data.
Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity (0 ≤ *RCA* < 1) reveal comparative disadvantage.

In the export of Agricultural Raw Materials, as shown in Table 3 and Figure 2, sub-Saharan Africa somehow had constant RCA index value of 2.5 during 2000–2006, followed by a decline to an RCA index value of 1.5. However, South Asia
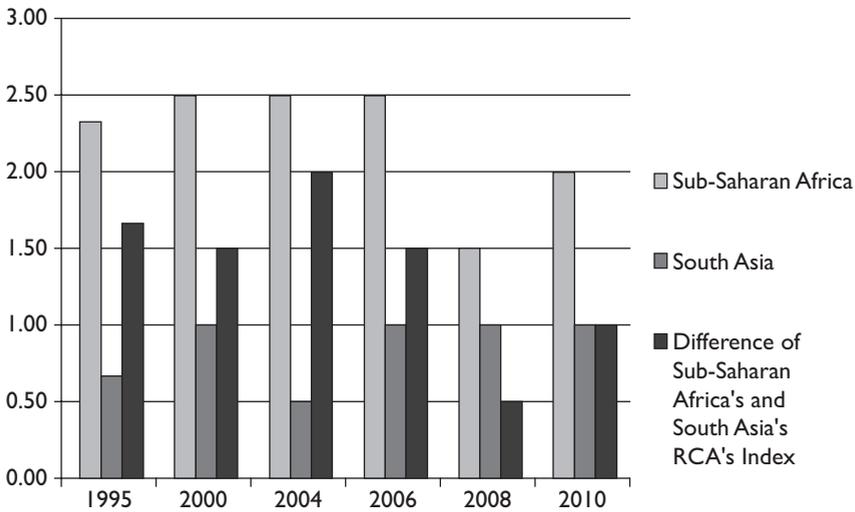
Figure 2. RCA of Agricultural Raw Materials Export of Sub-Saharan Africa and South Asia and RDCA

Source: Author's computation based on WDI data.
Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity (0 ≤ *RCA* < 1) reveal comparative disadvantage.

used to vacillate between revealed comparative *disadvantage,* during 1995 and 2004, and *indifferent* positions in the other periods. The gap in comparative advantage between sub-Saharan Africa and South Asia has been widening until 2004 followed by narrowing trend that reached to a minimum gap of about 0.5 index point in 2008. This gap continued widening afterwards.

In *Fuel* export even though sub-Saharan Africa region has a declining trend in its RCA, it has sizable comparative advantage and also has never experienced a status of comparative disadvantage during 1995–2010 (Table 3 and Figure 3). On the other hand, South Asia has managed to shift from the state of RCA to state of comparative advantage and indifferent positions from 2008 to 2010. It is interesting to see that the trend for the South Asia has almost steadily and consistently grown throughout the period 1995–2010. This can be evidenced from the fact that South Asia's RCA index ranged from 0.14 in 1995 to 1.17 in 2008. In comparative terms, the magnitude of RCA in export of fuel of the sub-Saharan Africa is much higher than South Asia. The gap in comparative advantage between sub-Saharan Africa and South Asia has been shrinking over time, almost continuously from 5 RCA index points to 1.58 during 1995–2010.

The RCA of sub-Saharan Africa in export of Ores and Metals in the world ranges from RCA index value of 2.33 in 2000 to 4.00 in 2008 (Table 3 and Figure 4). In this regard, sub-Saharan Africa has higher comparative advantage characterized by rising pattern. South Asia, on the other hand, has RCA during
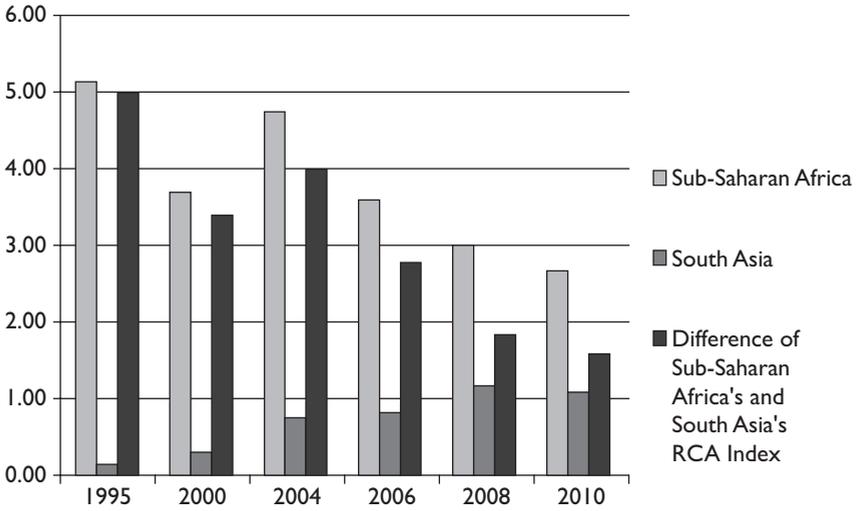
Figure 3. RCA of Fuels Export of Sub-Saharan Africa and South Asia and RDCA

Source: Author's computation based on WDI data.
Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity (0 ≤ *RCA* < 1) reveal comparative disadvantage.

Figure 4. RCA of Ores and Metals Export of Sub-Saharan Africa and South Asia and RDCA

Source: Author's computation based on WDI data.
Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity (0 ≤ *RCA* < 1) reveal comparative disadvantage.
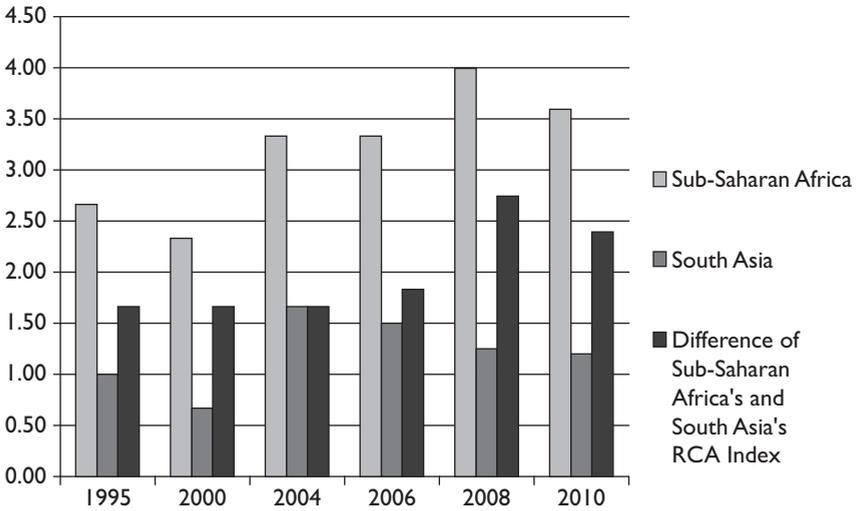
1995–2000. However, in 2004 South Asia has transformed possessing comparative advantage though followed by consistent decline in the strength of its comparative advantage afterwards. The RCA indices of South Asia range from 0.67 in 2000 to 1.67 in 2004. The gap in the degree of RCA between sub-Saharan Africa and South Asia is so wide throughout the period 1995 to 2010 ranging from 1.67 to 2.75. This indicates that the sub-Saharan Africa has higher RCA than South Asia during 1995–2010. Moreover, the gap has become wider in the later period.

Sub-Saharan Africa has RCA in export of manufactured goods in the world during the whole period from 1995 to 2010 (Table 3 and Figure 5). The RCA indices for this region are very low though there is improvement trend from 0.37 in 1995 to 0.45 in 2010. In the case of the South Asia, it has RCA in most of the years. South Asia has indifferent position in 1995 and improved its status and attained slight comparative advantage in export of manufactured goods in 2000. After 2000 South Asia has almost had constant RCA slightly lower than the point of indifference. In comparative terms, South Asia has stronger RCA than sub-Saharan Africa though both regions have comparative disadvantage in the export of manufactures.

To assess the relative strength of RCAs, the following definitions are set under four intervals: Very High for RCA > 2, High for 2 > RCA > 1, Low for 1 > RCA > 0.5 and Very Low for RCA < 0.5. For convenience, these four intervals are
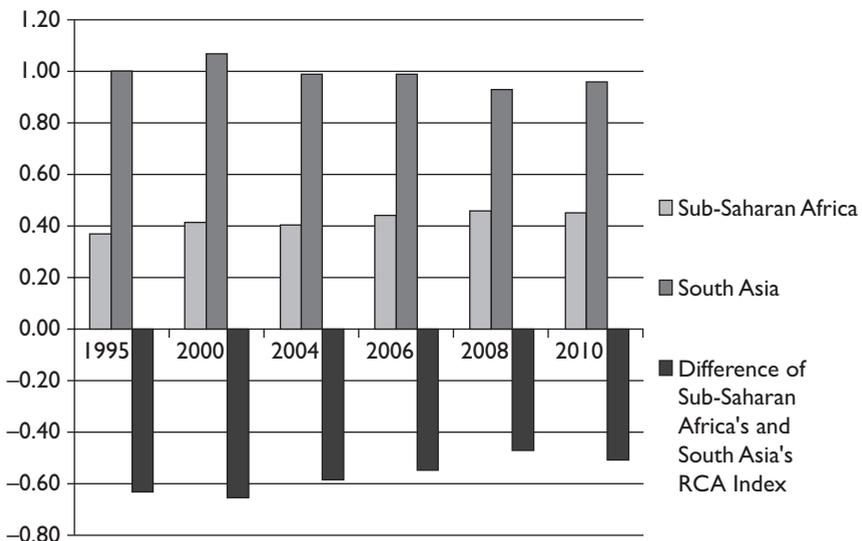

Figure 5. RCA of Manufactures Export of Sub-Saharan Africa and South Asia

Source: Author's computation based on WDI data.

Notes: Scores greater than unity (*RCA* > 1) reveal comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal comparative disadvantage.

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Table 4. Ranking of Average Revealed Comparative Advantage of Sub-Saharan Africa and South Asia

| | 1995–2004 | | | 2006–2010 | |
| | RCA | | | RCA | |
Rank	Sub-Saharan Africa	South Asia	Rank	Sub-Saharan Africa	South Asia
1	C > 2.0	A > 1.0	1	D > 2.0	A > 1.0
2	D > 2.0	D > 1.0	2	C > 2.0	D > 1.0
3	B > 2.0	E > 1.0	3	B > 2.0	C > 1.0
4	A > 2.0	B > 0.5	4	A > 1.0	B > 1.0
5	E < 0.5	C < 0.5	5	E < 0.5	E > 0.5

Source: Author's computation based on WDI data.
Notes: A—signifies Food Export of the region,
B—signifies Agricultural Raw Materials Export of the region,
C—signifies Fuels Export of the region,
D—signifies Ores and Metals Export of the region and
E—signifies Manufactures Export of the region.

written in Table 4 and Table 5 in the form of RCA > 2, RCA > 1, RCA > 0.5 and RCA < 0.5 to signify Very High, High, Low, and Very Low intervals respectively. To compare the changes sustained in RCA the averages of the RCA during 1995–2004 and 2006–2010 are used.

The ranking of RCA of the Sub-Saharan Africa indicates that *Fuel* and *Ores and Metals* exports are the two highest in RCA index values. Conversely, manufactured goods export ranks the least during 1995–2004 and 2006–2010. Their competitiveness and rank has been maintained with the exception that there is an improvement in competitive position of Ores and Metals export which shifted from second to first rank while Fuel export descended to second position. Moreover, it is disclosed that there is deterioration in competitiveness of Food export that slipped down from *Very High* to *High* competitive strength.

In the case of the South Asia, Food and Ores and Metals export items are first and second in their rank of competitive strength during the whole period. The study revealed that competitiveness of manufactures export has slipped to Low position, whereas exports of fuels and agricultural raw materials have improved to High position.

Sub-Saharan Africa which has four of the five subsectors in Very High competitive position has maintained it throughout the time period under consideration (Table 5). South Asia, which had three out of five subsectors in High competitive position, has grown to four subsectors during 2006–2010. This is because of improvement in competitiveness of Fuels, and Agricultural Raw Materials export. However, the competitive position of manufactures has deteriorated from High to Low position. Interestingly, the study revealed that manufactured goods export is common subsector for both regions, in which each has lower competitive position

Table 5. Intervals of Revealed Comparative Advantage (RCA)

	Average Value, 1995–2004				Average Value, 2006–2010			
Sub-Saharan Africa	Very High	High	Low	Very Low	Very High	High	Low	Very Low
A	A				A			
B	B				B			
C	C				C			
D	D				D			
E			E					E
South Asia								
A		A				A		
B			B			B		
C				C		C		
D		D				D		
E		E					E	

Source: Author's computation based on WDI data.

Notes: A—signifies Food Export of the region,
B—signifies Agricultural Raw Materials Export of the region,
C—signifies Fuels Export of the region,
D—signifies Ores and Metals Export of the region and
E—signifies Manufactures Export of the region.

in the world. In general, it can be concluded that the sub-Saharan Africa has higher competitive position than the South Asia in merchandise export with the exception of manufactured goods export.

Conclusion

The study reveals that despite small improvement, trade share of sub-Saharan Africa and South Asia regions remained very low as compared to their population's proportion in the world. Trade is skewed towards high-income economies and economic integration of the sub-Saharan Africa and the South Asia to the world is low. Economic integration is very strong amongst the few and small population-sized economies and very weak with the large number of countries categorized as low- and middle-income economies.

Both regions have RCAs on Food export. In comparative terms, it is higher in case of the sub-Saharan Africa, and the gap has fluctuated overtime. Sub-Saharan Africa has RCA in export of agricultural raw materials during the whole period from 1995 to 2010 showing signs of fluctuating with up and down trend. On the other hand, South Asia has vacillated between RCA and indifferent positions

during 1995–2010. In comparative terms, the sub-Saharan Africa has greater RCA than the South Asia.

Sub-Saharan Africa region has very strong RCA in export of Fuel during 1995–2010, though a decline is noticeable during the period. South Asia has managed to shift from a state of RCA to state of comparative advantage and indifferent positions during the same period. It is uncovered that while RCA of the sub-Saharan Africa declines South Asia exhibited a rising trend. Even though, the magnitude of the RCA in export of Fuel of the sub-Saharan Africa is much higher than the South Asia, the gap in between them is consistently shrinking.

Sub-Saharan Africa has stronger RCA and rising trend in export of Ores and Metals than the South Asia. On the other hand, South Asia has shown transformation from the RCA to comparative advantage position, though its strength has declined consistently. The gap of the regions has been wider in later period from 1995 to 2010.

Fuel and Ores and Metals exports are the two items which registered highest in RCA index values, whereas manufactured goods export ranks the least during 1995–2010 for the sub-Saharan Africa. Deterioration in competitiveness of Food export is observed. In case of South Asia, Food and Ores and Metals export items are the first and the second in their rank of competitive strength during the whole period. The competitiveness of manufactures export has slipped to lower position, while exports of fuel and agricultural raw materials have improved to show a higher competitive position during 2006–2010.

Sub-Saharan Africa has maintained four of the five subsectors in Very High competitive position throughout 1995–2010. South Asia, on the other hand, has enhanced its competitiveness to four subsectors in high position, mainly attributed to improvement in competitiveness of Fuels and Agricultural Raw Materials export. However, competitive position of manufactures export has deteriorated from High to Low position. Interestingly, the study reveals that manufactured goods export is the common subsector for both regions, in which they have lower competitive position.

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