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**STUCK IN THE MIDDLE?
The structure of trade between South Africa
and its major trading partners¹**

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Abstract: *This paper analyses the South African trade data from 1992 until 2006 by means of a Grubel-Lloyd index, a measurement of marginal intra-industry trade and a revealed comparative advantage (RCA) indicator. During this period a lot happened in South Africa that influenced trade policy, e.g. the political transition in 1994, the formation of the World Trade Organisation in 1995, the rise of China as trading power, etc. The purpose is not only to analyse the current structure of South African trade, but also to examine its structural change over time. As a result this paper shows that South Africa is principally a supplier of natural resources to both industrialised and emerging economies. With respect to its African neighbours South Africa has a more advantageous trading position.*

Keywords: South Africa; intra-industry trade; trade specialisation

JEL-Classification: F14

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1. Introduction

South Africa is one of the most interesting countries to examine in the context of trade policy and trade performance. First of all, its long history of apartheid created a society of abundant unskilled labour and a semi-industrialised economy. This is the reason why South Africa can neither be classified as a typical developing economy nor as an industrialised country. Also interesting, the South African government has pursued a rather liberal trade policy since transition to multi-racial democracy in 1994. South Africa is a member of the World Trade Organisation (WTO) since 1995, and has signed trade agreements with its major trading partners, e.g. the Trade, Development and Cooperation Agreement (TDCA) with the European Union (EU).

In general, a trade policy that aims at (reciprocal) liberalisation will lead to higher degrees of trade openness. Besides this pure increase of imports and exports, trade flows can have an inter- or intra-industry trade character and a country's gains of trade liberalisation will differ accordingly. Whereas both the Heckscher-Ohlin-Samuelson and the Ricardian trade model explain gains from trade specialisation, i.e. inter-industry trade flows, new trade models (e.g. Krugman et al., 1994, Melitz, 2003) based on monopolistic competition deal with gains of intra-industry trade flows.

The purpose of this paper is to examine South Africa's current trading position with regard to the world as a whole as well as to its main trading partners. The hypothesis used is that, despite political efforts, the South African economy is still a main supplier of primary products or lightly processed primary products, whereas its imports comprise mainly industrial products, i.e. manufactures. If this is the case, South African trade structure will be characterised by inter-industry trade flows. Furthermore, it is interesting to analyse the achievements of South African trade policy and to understand the structural changes of South African trade during 1992 and 2006.

The approach used in this paper is based upon earlier work of Alan G. Isemonger (2000) and R. G. Parr (2000). The former estimated intra-industry trade in South Africa, whereas the latter analysed specialisation in South African manufactures over time. This paper combines both approaches to analyse overall South African trade as well as trade with its major trading partners. Furthermore, the time period considered in this paper is longer, and a relationship

between an intra-industry indicator, an indicator to measure specialisation and a measure of revealed comparative advantage is established. On the basis of this analysis, another hypothesis that South Africa holds a middle position between its industrialised trading partners and emerging developing countries on the one hand and its African neighbours on the other hand can be tested.

The paper starts with a discussion of the data used. Besides describing the origin of the data, arguments are put forward to defend the level of aggregation as well as the chosen trading partners. Section 3 is concerned with analysis tools. To measure the degree of intra-industry trade an overall Grubel-Lloyd index is used. For each industry an indicator of revealed comparative advantage will be calculated. As will be mentioned in more detail, the interpretation of changes in the Grubel-Lloyd index over time is not straightforward; therefore a measurement of marginal intra-industry trade is needed. To conclude this section the relationship between these indicators is established.

In the following sections the analysis tools introduced are deployed on the trade data. Whereas Section 4 focuses on current trade position of South Africa, Section 5 is about the change in the trade pattern between 1992 and 2006. In addition to the analysis of import and export flows by industries in 2006, a closer look is taken at the trading partners. By means of this analysis major differences between industrialised, emerging and neighbouring trading partners are uncovered. The fact that the time period used covers fifteen years, allows looking for differences not only between industries and trading partners, but also between different sub periods. Moreover, the openness of the South African economy as well as a possible theoretical framework are being discussed. This paper ends with a conclusion summing up the main findings and indicating further fields of research.

2. Data

During the whole analysis trade data supplied by the South African Department for Trade and Industry (DTI, 2007) are used. This paper makes use of the 4-digit Harmonised System Classification, i.e. these classes are considered as different 'industries'. This approach will meet with criticism, but as other economists have pointed out, it is impossible to uniquely define the 'correct' level of aggregation. The decision to work with this level of aggregation

is based on the arguments by Herbert G. Grubel and Peter J. Lloyd (1971), Alan G. Isemonger (2000) and R. G. Parr (2000).

Although both value (nominal) and volume (real) trade data were at disposition, this paper utilises only nominal trade data. Although general opinion among economists would favour the use of real trade data, this decision is justified on three grounds. First of all, the method how real trade data was calculated was unknown. Despite attempts to contact the statistical division of the DTI, main information such as the used base year or deflators lacked. A first analysis of the real South African trade data showed that results were difficult to interpret without the missing information. Although other authors do not mention explicitly what type of data they used, an educated guess is that they also used nominal trade data. Thus doing likewise, makes the results of this analysis comparable with other studies.

With regard to the aspired dynamic analysis, the data used here covers the longest possible time period, i.e. all time series start in 1992 and end in 2006. In addition to the overall South African trade data, i.e. South African trade with the world, also trade flows between South Africa and its major trading partners are used. As Table 1 shows, these partners are CHINAS², the EU³, Japan, NAFTA⁴ and the SADC⁵.

% Exports 2006		% Imports 2006	
CHINAS	5.91%	CHINAS	12.23%
EU	31.87%	EU	34.65%
Japan	10.41%	Japan	6.50%
NAFTA	11.54%	NAFTA	8.71%
SADC	9.04%	SADC	2.24%
Sum	68.76%	Sum	64.33%

Table 1: Regional import and export shares

Because the number of exporting industries has to equal the number of importing industries for each regional aggregate, the DTI trade data were modified a bit. All industries with either missing import or export data and those with discontinuous, small time series were taken out of the samples. If time series appeared relevant and there existed no corresponding import or export data, the missing observations were filled with zeros. As a result of this adaptation the sample includes 1,236 EU-industries, 1,167 NAFTA-industries, 860 Japanese industries,

2 China, Hong Kong, Macao and Taiwan
3 Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, French Guiana, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, St. Helena, Sweden and the United Kingdom
4 Canada, Mexico and the United States of America
5 Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe

1,180 SADC-industries and 1,084 CHINAS-industries. In cases where use is made of the trade data of South Africa with the total world, the sample includes 1,249 industries.

Because it is difficult to compare at a glance the trade data of circa 1,000 industries during the period 1992-2006 across five regional aggregates, meaningful aggregates were looked for. These aggregates were found on the website of Foreign Trade On-Line (Foreign Trade On-Line, 2007)and are:

- Animal and animal products (Range: 0100-0599)
- Vegetable products (Range: 0600-1599)
- Foodstuffs (Range: 1600-2499)
- Mineral products (Range: 2500-2799)
- Chemicals and allied industries (Range: 2800-3899)
- Plastics and rubbers (Range: 3900-4099)
- Raw hides, skins, leather and furs (Range: 4100-4399)
- Wood and wood products (Range: 4400-4999)
- Textiles (Range:5000-6399)
- Footwear and headgear (Range: 6400-6799)
- Stone and glass (Range: 6800-7199)
- Metals (Range: 7200-8399)
- Machinery and electrical (Range: 8400-8599)
- Transportation (Range: 8600-8999)
- Miscellaneous (Range: 9000-9799)
- Service (Range: 9800-9999)

3. Analysis tools

Although there are some different approaches to analyse trade flows, this paper focuses on the intra-industry characteristics of South African trade flows. By intra-industry trade is meant simultaneous import and export of products within one industry. The opposite of intra-industry trade is inter-industry trade or specialised trade, i.e. imports and exports originate from different industries. To address the problem of measuring intra-industry trade a Grubel-Lloyd index will be introduced. Furthermore, the competitiveness of South Africa's economy will be determined by means of a comparative advantage indicator. Another indicator that will be introduced is a measurement of marginal intra-industry trade, a dynamic indicator. It

is used to examine the structural change that took place between 1992 and 2006. This section discusses these three indicators into more detail and exhibits the linkage between them.

3.1. *Grubel-Lloyd index*

The Grubel-Lloyd index of intra-industry trade was developed by Herbert G. Grubel and Peter L. Lloyd during the second half of last century to measure the level of intra-industry trade of one industry or of the whole economy (Grubel and Lloyd, 1971). This index compares the total amount of trade of one industry, i.e. the sum of exports and imports, with the absolute value of net exports, i.e. the difference between exports and imports of this industry. Formally the Grubel-Lloyd index (GL) for an industry i is defined as:

$$GL_i = \frac{(X_i + M_i) - |X_i - M_i|}{X_i + M_i} = 1 - \frac{|X_i - M_i|}{X_i + M_i}.$$

The absolute difference between the imports and exports of industry i indicates the level of inter-industry trade, i.e. the exports (imports) of industry i that are not matched by the imports (exports) of this industry. Because this index is normalised, the value of this index ranges between zero and one. It should be clear that zero indicates total inter-industry trade, whereas one represents a trade pattern characterised by intra-industry exchange.

Based upon the GL of each individual industry the overall Grubel-Lloyd index of the economy can be calculated, i.e. the overall GL is defined as the sum of the weighted GL of each industry. The interpretation of this indicator remains the same and gives an indication of the overall intra-industry level of trade. The formal definition of the overall Grubel-Lloyd index is:

$$GL = \sum_i \left(GL_i \cdot \frac{X_i + M_i}{X_{tot} + M_{tot}} \right) = \sum_i \left[\frac{(X_i + M_i) - |X_{t,i} - M_{t,i}|}{(X_i + M_i)} \cdot \frac{(X_i + M_i)}{(X_{tot} + M_{tot})} \right] = 1 - \frac{\sum_i |X_i - M_i|}{\sum_i (X_i + M_i)}$$

The main reasons to make use of the Grubel-Lloyd index are its simple calculation and its straightforward interpretation. Moreover, other authors also calculated this indicator for the South African economy which makes the results of this paper comparable with theirs.

3.2. *Measuring the Revealed Comparative Advantage (RCA)*

Another intent of this paper is to find out in which industries the South African economy possesses comparative advantages and disadvantages. Based upon this information, the strengths and weaknesses of today's South African economy can be identified, i.e. one can define which industries are competitive on an international market and which industries are at risk.

The comparative advantage of an industry can be calculated by different means, as pointed out by Bela Balassa (1989). Despite the range of possibilities, in the present case the lack of appropriate data obliges one to analyse the comparative advantage of industries using trade data.⁶ The RCA-indicator developed by B. Balassa (1989) requires the collection of world export data for all used industries. Therefore another RCA-index was looked for, which could be calculated without collecting new data. Moreover the concept of RCA-indices is not without any criticism and there exists quite diverse opinions, how such an indicator should look like (Bowen, 1983, 1986, Yeats, 1985, Vollrath, 1991).

In his textbook "Außenwirtschaft" Horst Siebert (2000) offers an alternative RCA-index. Siebert's measure compares the exports and imports of one industry with the total exports and imports of that economy. This measure is used to analyse South Africa's trade and to indicate industries with a comparative (dis)advantage. Formally the measure is defined as:

$$RCA_i = \left[\frac{X_i - M_i}{X_i + M_i} - \frac{\sum (X_i - M_i)}{\sum (X_i + M_i)} \right] \cdot \frac{100}{1 - \frac{\sum (X_i - M_i)}{\sum (X_i + M_i)}}$$

The first term within the brackets is a kind of Grubel-Lloyd index of industry i and normalises net trade of this particular industry to the total trade of this industry. The right term within the brackets compares the overall net trade with the total value of trade. According to this notation, a competitive industry is thus an industry with a higher relative level of net trade than the overall economy. The last term is a correction term for the balance of trade. If the economy has a balance of trade surplus, the RCA-values become bigger. From the construction of the measure it should be clear that an industry with a comparative advantage

⁶ This method assumes that an economy exports only products for which it has a comparative advantage and imports goods for which it has a comparative disadvantage. Trade flows are thus indirectly used to reveal those industries with a comparative advantage or disadvantage.

has a positive RCA-value, whereas uncompetitive industries have negative RCA values. The magnitude of the comparative (dis)advantage is indicated by the size of the RCA-measure.

3.3. *Marginal Intra-Industry Trade*

Although the Grubel-Lloyd index is a useful measure to analyse the trade structure of a country, it cannot be used to examine the change of this trade structure over a certain period, i.e. it is not a dynamic measure. Due to the definition of this index, an observed increase between two periods does not automatically mean increased intra-industry trade. The cause could be the direct opposite of it, i.e. the specialisation of an industry characterised by an inter-industry change of trade. Therefore other, dynamic indices to measure the change in intra-industry trade were developed (e.g. Greenaway et al., 1994, Brülhart, 1994, Azhar et al., 1998).

In this paper a marginal intra-industry trade index is employed, which was developed by Marius Brülhart (1994), because it allows a differentiated interpretation of trade structure changes and it is also handy and easy to apply. The index measures marginal intra-industry trade, i.e. the change in exports and imports of industry i between two periods. M. Brülhart defines his indicator as:

$$D_i = \frac{\Delta X_i - \Delta M_i}{|\Delta X_i| + |\Delta M_i|}.$$

The value of this index ranges between minus one (-1) and one (1) and divides all observations into three categories. If the value is (close to) 0, changes in exports equal changes in imports and marginal intra-industry trade is high, i.e. changes in this industry have an intra-industry character. Marginal trade with an inter-industry trade character are indicated by values close to 1 or -1. If exports grow much faster than imports or exports decline less than imports, the index will be (close to) 1 and can be interpreted as the specialisation of the economy *into* this industry. Sectors for which the index is (close to) -1 are sectors where the economy specialised *out of* during the observed period.

To conclude this section the relation between the three indicators is displayed in Table 2. This table shows the values of the Grubel-Lloyd and the RCA-index associated with certain values of the net exports of an industry i . Furthermore the change of these indicators with

respect to Brühlhart's measure is shown. Note that an increase of the overall Grubel-Lloyd index (see last column) can have different causes.

Net-Exports	GL _i	RCA _i	Change over time	D _i	ΔGL _i	ΔRCA _i ⁷	ΔGL _{tot}
$X_i \gg M_i$	≈ 0	> 0	$\Delta X_i \approx \Delta M_i$	≈ 0	?	?	?
			$\Delta X_i \gg \Delta M_i$	≈ 1	?	?	< 0
			$\Delta X_i \ll \Delta M_i$	≈ -1	?	?	> 0
$X_i \approx M_i$	≈ 1	≈ 0	$\Delta X_i \approx \Delta M_i$	≈ 0	≈ 0	≈ 0	?
			$\Delta X_i \gg \Delta M_i$	≈ 1	< 0	> 0	< 0
			$\Delta X_i \ll \Delta M_i$	≈ -1	< 0	< 0	< 0
$X_i \ll M_i$	≈ 0	< 0	$\Delta X_i \approx \Delta M_i$	≈ 0	?	?	?
			$\Delta X_i \gg \Delta M_i$	≈ 1	?	?	> 0
			$\Delta X_i \ll \Delta M_i$	≈ -1	?	?	< 0

Table 2: The relation between the three indicators

4. The trade pattern in 2006

In 2006 South Africa exported about Rand 396 billion whereas imports amounted to a value of Rand 465 billion, i.e. the trade balance was negative. On the aggregated 16-industry level the groups “stone and glass” and “metals” produced the biggest trade surplus, whereas industries from the groups “machinery and electrical”, “service” and “mineral products” were in deficit.

The trade balance between South Africa and both the EU and the CHINAS-group were in favour of the latter two. Trade with Japan, the NAFTA-group and the SADC-group did not generate enough surpluses to compensate for the loss. This deficit, combined with a trade deficit with the rest of the world, yields the overall balance of trade deficit.

In Figure 1 the South African exports by industry aggregates and by trading partner are displayed. The biggest exporting industry aggregates were “stone and glass”, “metals” and “mineral products” with an export share of 28.23%, 17.25% and 14.33%, respectively. The main export products of these industry groups were coal, briquettes, non-crude oil, diamonds, gold, platinum and ferro-alloys, i.e. mostly natural resources and metals which can be found in the rich South African ground. Within the industry aggregates “machinery and electrical” and “transportation” both groups had an export share of almost 10%. Main exports were centrifuges and filters, and motorcars and vehicles for transporting persons, respectively.

⁷ Note that the RCA-values of other industries, ceteris paribus, can also change.

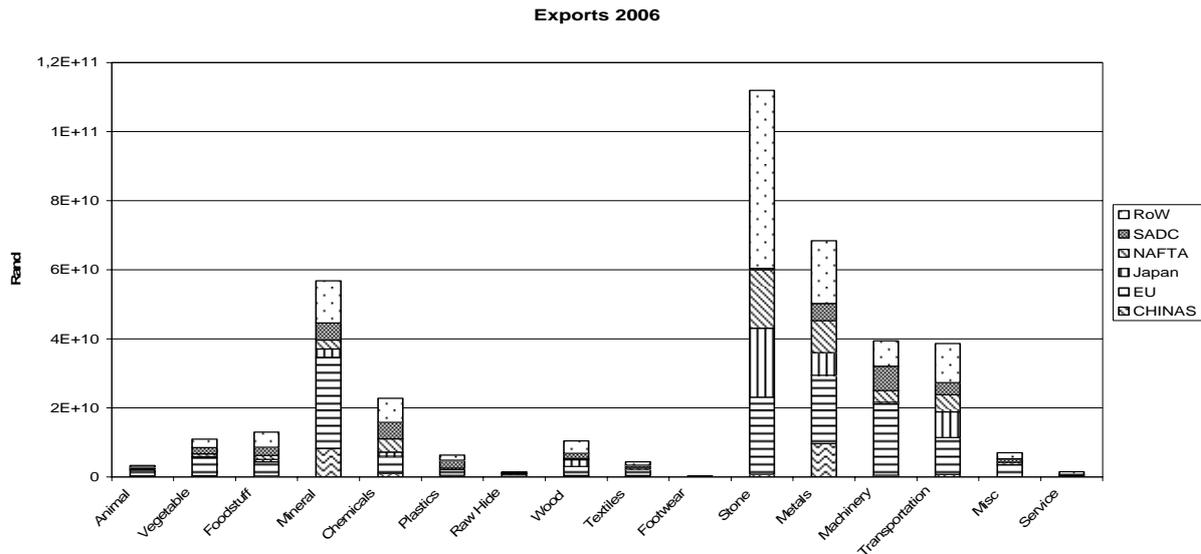


Figure 1: South African exports by industry aggregates and by trading partner

As already shown, the overall export share of the trading partners amounted to 68.76% in 2006 (see Table 1). The EU was the major customer of South Africa, whereas the SADC was in this sample South Africa's smallest trading partner. Over 50% of "stone and glass" exports went to one of the industrialised trading partners. For exports of the "metals" group not only the EU and the NAFTA-group were important destinations, but also the CHINAS-group was a key market. Almost half of the "mineral products" exports were destined for the EU and 14.55% went to the CHINAS-group. Although already 52.44% of the "machinery and electrical" exports went to the EU, the SADC and the NAFTA-group are two other important destinations. Except for the CHINAS-group all trading partners absorbed a significant share of "transportation" exports. For products of both the "plastics and rubbers" and the "footwear and headgear" group the SADC is the biggest export market with an export share of 37.16% and 32.79% in 2006, respectively.

Figure 2 shows the South African imports by industry aggregates and by trading partner. Although imports are concentrated in the "machinery and electrical", "mineral products" and "transportation" industry aggregates, with import shares of 26.01%, 19.09% and 11.63%, respectively, in comparison with exports, South African imports are more diverse. Besides fuel (e.g. crude oil and coal) South African imports comprised mainly manufactures (e.g. automatic data processing machines, transistor apparatus for radio telephony and motor cars and vehicles for transporting persons) and services.

Imports 2006

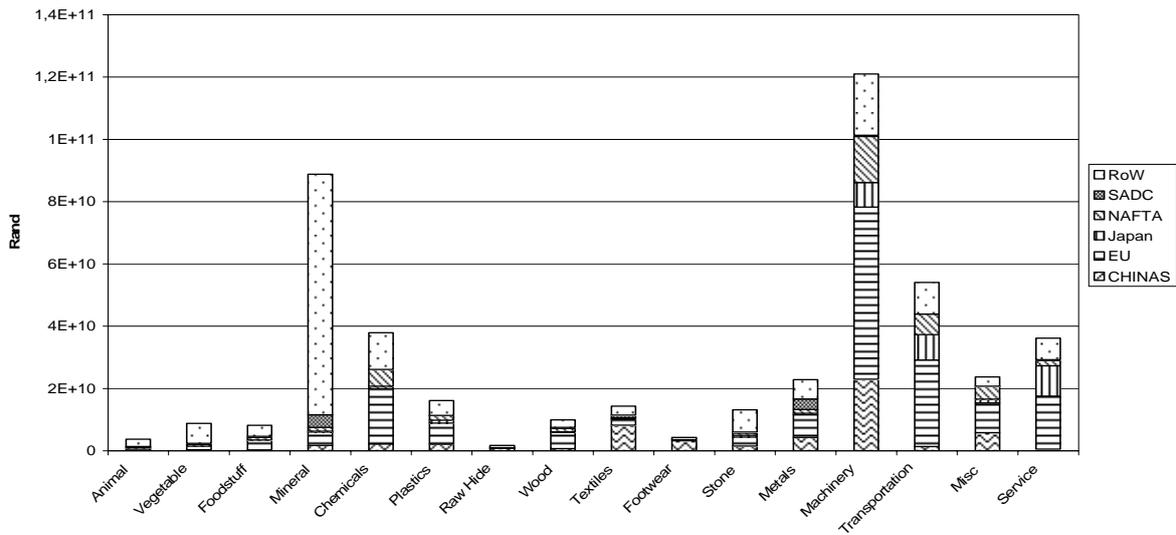


Figure 2: South African imports by industry aggregates and by trading partner

Notwithstanding an overall slightly smaller import than export share of the trading partners, both the EU and the CHINAS-group had a higher import share, 34.65% and 12.23% respectively (see Table 1). Moreover whereas the CHINAS-group was for none of the industry aggregates the biggest export market, it is South Africa’s biggest supplier of “raw hides, skins, leather and furs”, “textiles” and “footwear and headgear”. Whereas only the industrialised trading partners were the main suppliers of “transportation” products, the CHINAS-group was together with the EU and the NAFTA-group a main supplier of “machinery and electrical” imports. Because none of the trading partners is known as a major exporter of crude oil, the import shares within the “mineral products” industry aggregate were rather small. With respect to the SADC, only imports of the “metals” industry aggregate were noteworthy, because 14.75% off all “metals” imports originated from this region.

So far the analysis of South African trade data showed that the South African economy obtains a balance of trade surplus by exporting primary products, especially natural resources and metals. With regard to manufactures and services, South Africa is a net importer. The higher demand for machinery, transportation equipment and mineral products yielded a balance of trade deficit. Moreover, South Africa’s exports were rather concentrated on some products, whereas imports were more diverse. The hypothesis that South Africa is a net exporter of primary products and a net importer of manufactures and services is confirmed by this rough analysis. To determine the dimension of this observation a closer look to the available data by means of the analysis tools described in Section 3 is needed.

For the year 2006 the overall Grubel-Lloyd index was calculated to be 0.3059, i.e. only 30.59% of total South African trade was intra-industry. H. G. Grubel and P. J. Lloyd (1971) showed that the regionally disaggregated Grubel-Lloyd index is lower than the overall index. This is also the case for South Africa, where for trade with the EU, Japan and the NAFTA-group the index takes the values of 0.1971, 0.1771 and 0.1776, respectively. The Grubel-Lloyd index for the regional disaggregates CHINAS and SADC is extremely low: in 2006 the values were 0.0327 and 0.0641, respectively. If one keeps in mind that a Grubel-Lloyd index below 0.3333 means that either exports or imports are five times as big as their respective counterpart, these indices show clearly that South African trade is hardly characterised by intra-industry trade.

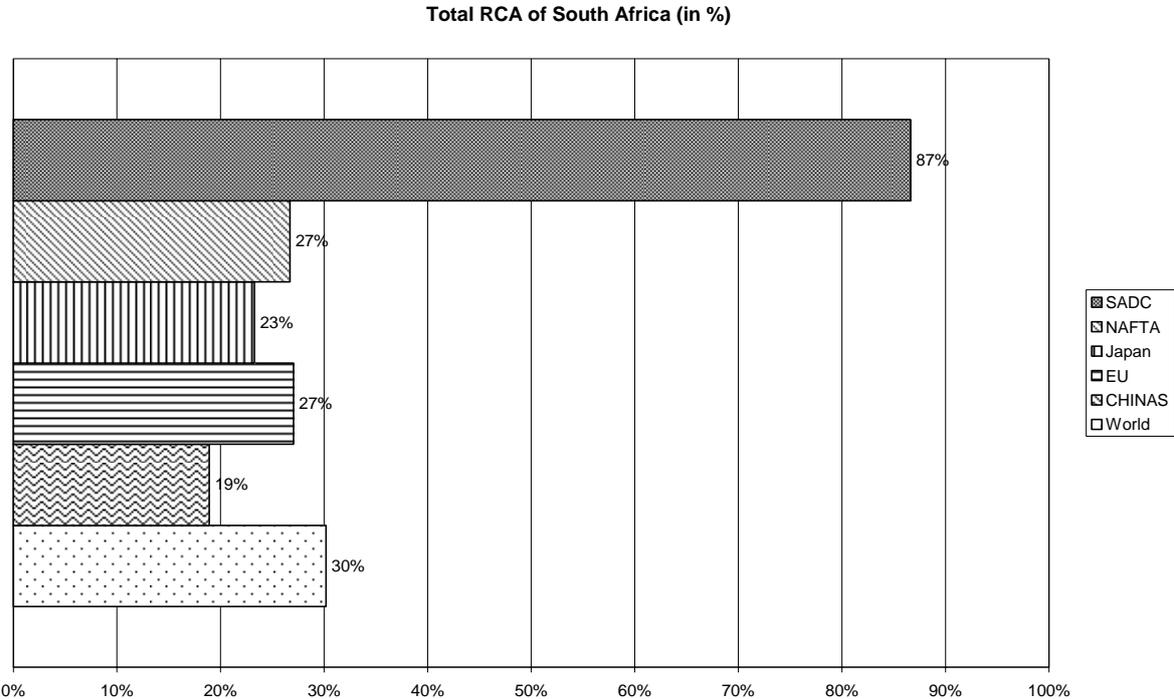


Figure 3: Percentage of South African industries with a positive RCA

Figure 3 shows the percentage of South African industries that had a revealed comparative advantage, i.e. a positive RCA-value, with respect to six different regions in 2006. With regard to South African trade with the world as a whole, 30% of all South African industries exhibited a positive RCA-value in 2006, and the ratio of the trade deficit to the amount of overall trade was about 7%. This result – combined with the fact that the trade structure of South Africa was characterised by inter-industry trade – means that the comparative advantage of these industries was quite high. On the regionally disaggregated level only around one fourth of these industries have a comparative advantage with regard to the EU, Japan and the NAFTA-group. In the case of trade with the CHINAS-group, only one fifth of all sectors are competitive. The trade position of South Africa with respect to its African

neighbours is characterised by a huge percentage of sectors (over 85%) with a comparative advantage. Whereas the relatively small number of competitive industries with a trade surplus was sufficient to generate a trade surplus with Japan and the NAFTA-group, the trade surplus of industries which were competitive with the EU and the CHINAS-group was too small to achieve a positive trade balance.

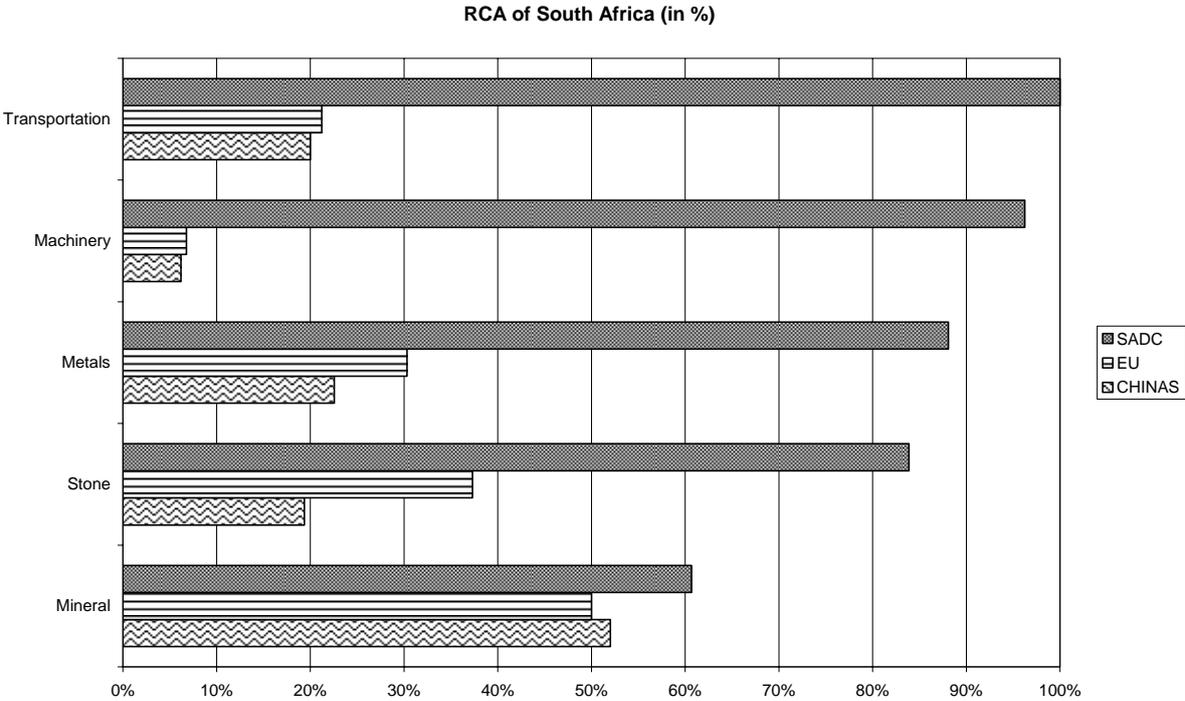


Figure 4: Percentage of industries with a positive RCA for selected trading partners and industry aggregates

Figure 4 is used to further investigate the striking difference between the trading partners. For ease of analysis, only selected industries and trading partners are displayed. The five industry aggregates shown are those with the highest import or export share in 2006. With regard to the choice of trading partners, the figure shows numbers for the EU, as a representative for industrialised trading partners, the CHINAS-group, which is an emerging trading power, and the SADC-group, i.e. a set of developing economies. A remarkable phenomenon can be observed in this figure. In those industry aggregates where the competitiveness of the South African economy with respect to the SADC-group is relative small, the percentage of competitive industries with regard to the EU and the CHINAS-group is rather high. This can be explained by the rich endowment of South Africa and its neighbours with natural resources. In contrast, in processing and manufacturing industries South Africa has competitiveness with regard to the SADC-group, whereas compared to the EU and the CHINAS-group it is less competitive.

The overall analysis shows that South Africa is mainly a supplier of minerals, metals and other natural resources as well as agricultural products to the world. At the same time it imports mostly machines, transportation equipment and minerals such as crude oil. Although South African governments have tried to build up a competitive domestic manufacturing industry and to diversify exports, the trade structure is mainly characterised by inter-industry trade⁸. South African exports are concentrated on some basic industries and products, i.e. South African exports are little diversified, whereas imports are more diverse. The Grubel-Lloyd index is rather low and although smaller Grubel-Lloyd indices for the disaggregated region data were expected, the difference was striking.

Looking at South African trade flows allocated to regional aggregates, one gets the impression that South Africa is stuck in the middle between highly competitive developing countries, industrialised countries and its African neighbours. Both the emerging developing countries and the industrialised countries buy natural resources (incl. minerals and metals) from South Africa. Whereas the former group sells low-tech manufactures such as clothing products and IT hardware, the latter group supplies the South African economy with high-tech products (e.g. pharmaceuticals and medical equipment) and services. The rather dominant position of South Africa within the SADC is reinforced by this analysis of the trade flows. Due to its rich natural resources (e.g. diamonds, gold, platinum, etc.) South Africa will continue to supply the world with these products, i.e. it holds a comparative advantage for these products, and trade with them will thus always have an inter-industry character.

⁸ Unfortunately, no comparable data on the trade structure of other semi-industrialised countries (e.g. Brazil or Malaysia) were found.

5. An analysis of the change of the South African trade structure over time

5.1. The recent history of South Africa opening up to trade.

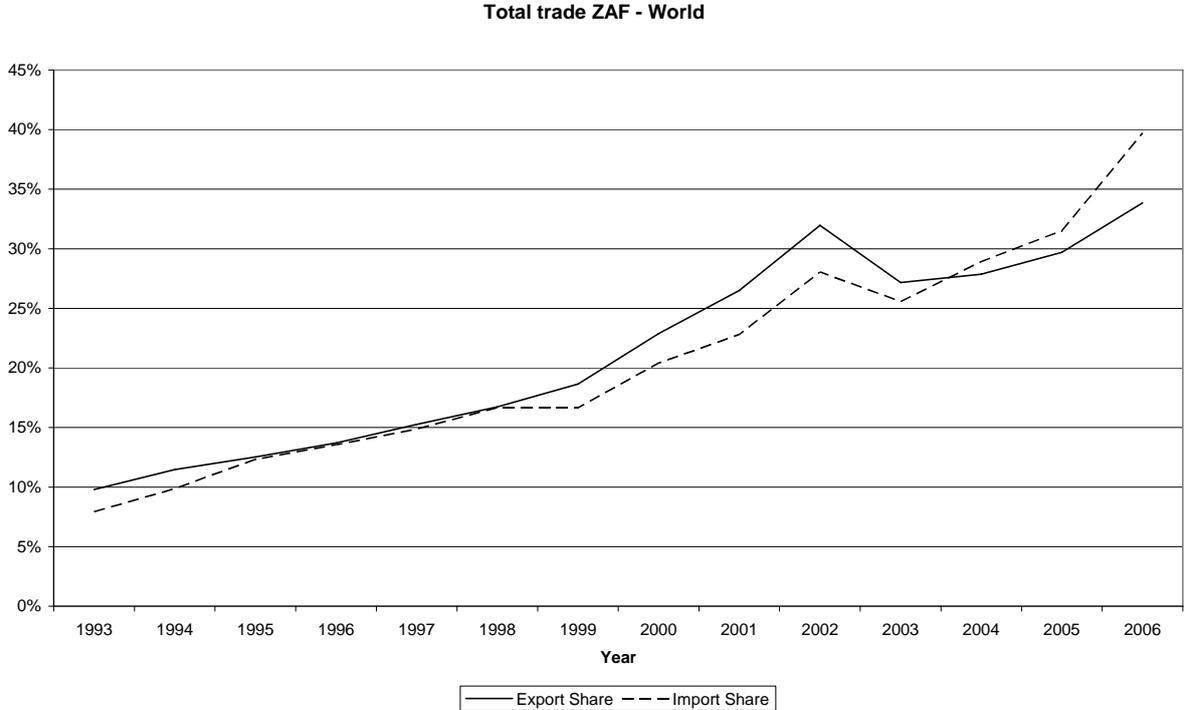


Figure 5: Export and import shares between 1993 and 2006

To establish some further key figures about the South African trade structure use is made of trade shares, i.e. trade flows normalised by nominal GDP. The GDP figures are from Statistics South Africa (2007). Because the GDP time series start in 1993, observations for the year 1992 are left out for this analysis. Both the export- and import share are plotted in Figure 5, which shows that, except for the year 2003, the share of both South African exports and imports increased steadily during the period 1993-2006. Whereas in 1993 the export and import shares were, respectively, 9.79% and 7.93%, in 2006 these values amounted to 33.85% and 39.70%, respectively. From 1993 until 2003 South African net exports were positive, although they were rather small between 1995 and 1998. Since 2004 South Africa has faced a negative trade balance, caused by a higher growth of imports. On the disaggregated regional level an opening of the South African economy is also noticeable, i.e. between 1993 and 2006 all trade figures increased.

Growth Rates (r)		1993-2006	1993-1999	1999-2006
World	Exports	0.1002	0.1134	0.0889
	Imports	0.1320	0.1317	0.1322
CHINAS	Exports	0.0979	0.0626	0.1292
	Imports	0.1814	0.1317	0.2257
EU	Exports	0.1282	0.1797	0.0858
	Imports	0.1152	0.1363	0.0975
Japan	Exports	0.1497	0.1411	0.1572
	Imports	0.0768	0.0460	0.1040
NAFTA	Exports	0.1325	0.1829	0.0911
	Imports	0.0906	0.1391	0.0507
SADC	Exports	0.1001	0.1453	0.0627
	Imports	0.1353	0.0890	0.1766

Table 3: Growth rates of export and import shares

The growth rate of both import and export shares were calculated not only for total South African trade, but also for South African trade with the regional aggregates. In addition to this regional differentiation the overall time period is divided into two sub periods. The breakpoint used has two advantages. First, it divides the overall time period in two (almost) equal time series. Second, it also marks the year in which South Africa signed a trade agreement with its biggest trading partner, i.e. the EU. For this purpose a basic definition of a growth rate was used, namely:

$$X_t = X_0(1+r)^t.$$

Results are shown in table 3 and indicate overall slower growth of export than of import shares between 1993 and 2006. Whereas the growth rate of the export share decreased in the second period, the import share grew even faster in this period. Trade with the CHINAS-group grew significantly faster during the second period with import shares growing almost twice as fast as export shares. Although the growth rate of the export share to the EU exceeded the respective growth rate of the import share during the first period, the latter decreased less during the second period, resulting in slightly faster growing import than export shares in this period. The growth rate of the South African export share to Japan was rather constant at 14%, but the growth rate of the import share doubled in the second period. Notwithstanding a decrease in the growth rates of the NAFTA-group, the export share grew by 4% faster than the import share over the whole period. Trade with the SADC is characterised by a decreasing growth rate of the export share and an increasing growth rate of the import share.

On the aggregated industry level annual export growth rates of both “mineral products” and “metals” were constant around 11% and 12%, respectively. The “stone and glass” industries managed to achieve a much higher export growth rate during the second sub-period, i.e. around 13%, resulting in an overall growth of 8.19% between 1993 and 2006. Overall, export

flows of the “machinery and electrical” and the “transportation” industries increased significantly by a rate of 18% between 1993 and 2006. Especially the strong growth during the first sub period, i.e. a growth rate of 25%, caused this result. Although most industry aggregates had a smaller growth rate of exports during the second sub period, only the “raw hides, skins, leather and furs”, “textiles”, “footwear and headgear” and “service” aggregates showed negative growth rates. In general import growth rates were more stable. Imports of the “stone and glass”, “metals” and “machinery and electrical” aggregates grew annually by 11%, 14% and 12%, respectively. Whereas until 1999 imports of the “transportation” aggregate grew only by 0.34% annually, its import share increased annually with 21% since then. The overall import growth rate of the “mineral” industry group was with 42% rather high. In this case there is also a significant difference between the two sub periods, i.e. a growth rate of 67% during the first sub period in comparison to a growth rate of 23% during the second sub period.

Against the background of political transition the increased trade activity of South Africa should not come as a surprise. During the apartheid era South Africa was forced to pursue a more or less autarkic economic policy. Due to economic sanctions on South African exports, imports had to be moderate in order to avoid a balance of payments deficit. Since transition in 1994 the South African government has pursued a rather liberal trade policy. Since 1995 South Africa is a member of the World Trade Organisation (WTO), and it has signed trade agreements with its major trading partners, e.g. the Trade, Development and Cooperation Agreement (TDCA) with the European Union (EU) in 1999. This trade policy entailed the opening of South Africa’s domestic market for foreign imports. As Peter Draper (2003) points out, the number of tariff lines dropped after the multilateral WTO-negotiations from over 12,000 to around 7,800, with most of these reductions having taken place within the manufacturing sector. As tariff data of the WTO on South Africa shows, between 2000 and 2005 the number of tariff lines decreased further from around 7,800 to about 6,700 (WTO, 2007). Notwithstanding these facts there is a vivid debate among economists concerning the extent of South African trade liberalisation during the 1990s (e.g. Rangasamy and Harmse, 2003, Holden, 2005, Fedderke and Vaze, 2004, Edwards and Lawrence, 2006). In this paper multi- and bilateral trade agreements which resulted in lower import tariffs are seen as cause of the increased openness of South Africa.

5.2. *The theoretical framework*

Based on the facts, established in Section 4, that South African trade displayed clearly an inter-industry trade pattern and that it opened up its domestic market for foreign products, a Heckscher-Ohlin trade model appears suited best as theoretical framework to analyse the change of the South African trade structure over time. Within this model the different factor endowments between trading partners constitute the main reason for countries to trade. If the SADC is left out of this model, a three-factor, three-good and three-country setup can be used to describe trade between South Africa, the industrialised countries (i.e. the EU, Japan and the NAFTA-group) and the CHINAS-group. The production factors considered are natural resources, unskilled and skilled labour, which are all used in the production of three goods, but with different intensity. Furthermore, the South Africa economy is endowed with a lot of natural resources and very little skilled labour, the CHINAS-group disposes of an enormous amount of unskilled labour, but little natural resources, and the EU has a lot of skilled labour at its disposal, but a sparse amount of unskilled labour.

Within this framework it should be clear that each country exports the good for which it has, due to its factor endowment, a comparative advantage. However, this means not that each country will export to both other countries. If an autarkic country opens up its market, relative world prices will give an incentive to export goods, in which it has a relative advantage to the rest of the world and to import other goods. Because exports and imports are still subject of tariffs, not all goods will be traded.

5.3. *Analysing trade flows over time*

Table 4 shows the Grubel-Lloyd indices for every year of the investigated period. One notices immediately the rather low values of these indices, i.e. South African trade was characterised by a high degree of inter-industry exchange over the whole period. This result supports the decision to refer to a Heckscher-Ohlin framework. The value increased during the period, but one cannot argue for an intra-industry pattern of trade.

Furthermore, these results are supported by the findings of other studies (e.g. Parr, 2000, Isemonger, 2000, Smet, 2006). A. G. Isemonger estimated an annual weighted Grubel-Lloyd index for South Africa for the period 1993-1996 and found values ranging between 0.20 and 0.24. R. G. Parr mentions a calculated Grubel-Lloyd index of 0.35 for the year 1998. Although the index of this research is lower, one has to notice that R. G. Parr considered only

manufacturing industries, i.e. the sample of industries of this paper is bigger. Both A. G. Isemonger and R. G. Parr used the 4-digit Harmonised System, whereas earlier findings (Smet, 2006) are based upon the 2-digit Standard International Trade Classification (second revision). Although a direct comparison is thus difficult, these results also support the image of an inter-industry trade pattern.

Year	Grubel-Lloyd Index	Year	Grubel-Lloyd Index
1992	0.2290	2000	0.2752
1993	0.2673	2001	0.2819
1994	0.1958	2002	0.2861
1995	0.2177	2003	0.2873
1996	0.2339	2004	0.2954
1997	0.2443	2005	0.3173
1998	0.2499	2006	0.3059
1999	0.2696		

Table 4: Annual overall Grubel-Lloyd Index (ZAF - World)

By means of the relationship between the three analysis tools the change of the overall Grubel-Lloyd index can be interpreted. Besides the analysis of the overall time period, a comparison between sub periods was also made. As already argued above, the year 1999 is used to break up the time period. As Table 2, i.e. the table describing the relation between the indicators, shows, other arbitrarily chosen criteria are also needed to allocate industries into three categories. A first allocation uses the Grubel-Lloyd index and the RCA-value of the base year of the respective time period for each individual industry. Because it is very unlikely that all industries have a Grubel-Lloyd index close to zero or close to one, a cut-off value is needed. In line with R. G. Parr (2000), a cut-off value of 0.65 is used, i.e. industries with a Grubel-Lloyd index bigger than 0.65 are characterised by intra-industry trade and are assigned to category B. This cut-off level is a reasonable criterion, because a Grubel-Lloyd index of 0.65 means that either the imports of the respective industry are about twice as big as its exports or vice versa. Industries with a Grubel-Lloyd index equal or below 0.65 are further allocated by means of their RCA-value to category A (i.e. industries with a trade surplus and a revealed comparative advantage) and to category C (i.e. industries with a trade deficit and a revealed comparative disadvantage). Within each category a further break down by means of the Brühlhart-measure (D-value) can be executed. Industries of category A, which experienced an intra-industry change, are assigned to category AA, i.e. industries in the category AA have a D-value between -0.65 and 0.65. If the D-value of an industry of category A is above 0.65,

the South African economy specialised *into* this industry and this industry allocated to category AB. The Brühlhart-measure allows identifying industries out of which the South African economy specialised, i.e. a D-value below -0.65. These industries are indicated by the category AC. Categories B and C were further broken down in similar manner. As a result, for each time period all industries were allocated to one of the nine categories. Results are shown in Table 5.

		1992-2006	1992-1999	1999-2006
A: $X_i \gg M_i$	AA: $\Delta X_i \approx \Delta M_i$	9.08 %	7.12 %	7.76 %
	AB: $\Delta X_i \gg \Delta M_i$	7.53 %	10.80 %	7.36 %
	AC: $\Delta X_i \ll \Delta M_i$	7.12 %	5.81 %	10.91 %
B: $X_i \approx M_i$	BA: $\Delta X_i \approx \Delta M_i$	9.08 %	9.00 %	8.97 %
	BB: $\Delta X_i \gg \Delta M_i$	1.64 %	3.68 %	3.23 %
	BC: $\Delta X_i \ll \Delta M_i$	5.94 %	4.01 %	9.38 %
C: $X_i \ll M_i$	CA: $\Delta X_i \approx \Delta M_i$	20.46 %	23.09 %	14.71 %
	CB: $\Delta X_i \gg \Delta M_i$	6.14 %	9.00 %	6.47 %
	CC: $\Delta X_i \ll \Delta M_i$	32.98 %	26.68 %	31.20 %

Table 5: The allocation of all industries in percentage

As already mentioned before, trade liberalisation within a Heckscher-Ohlin framework leads to increased specialisation, i.e. simultaneously an increase of both exports (captured by the categories AA and AB) and imports (captured by the categories CA and CC). As shown in Table 5 almost seventy percent of total trade is covered by these categories, a further indicator to support this theoretical framework. Based on the figures of Table 5, a possible explanation for the small increase of the overall Grubel-Lloyd index between 1992 and 2006 could be a bigger influence of the industries of the AA, AC, CA and CB categories. This hypothesis is also confirmed by looking at the industry groups with the biggest import and export shares, i.e. the “mineral products”, “stone and glass”, “metals”, “machinery and electrical” and “transportation” aggregates. The differences between the two sub periods are mostly within the AC, BC, CA and CC categories, indicating a decrease of trade surpluses (AC) and increasing trade deficits (CC). Especially the increased number of CC-industries within the “stone and glass” and “machinery and electrical” groups as well as the number of industries allocated to the AC category within the “metals” industry aggregate are worth mentioning.

Over the whole period trade with the CHINAS-group was characterised by a very low level of the Grubel-Lloyd index, i.e. it varied between 0.03 and 0.05. The marginal variation of this index is no surprise, if one looks at the allocation of the industries. More than 70% of all industries are allocated to the C category, 62% of which to the CC category, and an additional 20% belong to the A category. Between the two sub periods the percentage of industries allocated to the CB category was cut in half from about 14% to 7%, and the CC category grew

bigger by 10 percentage points from 50% to 60%. This trend can also be observed within each industry group, inducing a decrease of the RCA-values.

Although the allocation of the industries with regard to South African trade with the EU is roughly similar, i.e. about 20% to the A category and around 70% to the C category, a higher Grubel-Lloyd index is generated due to a different distribution on the sub category level. With respect to the Trade, Development and Cooperation Agreement, there is no significant difference between the two sub periods. Instead of observing an increase of industries allocated to the AB as well as the CC category, a small decrease can be detected.

In 1992 a very low Grubel-Lloyd value, i.e. below 0.10, for both trade with Japan and the NAFTA-group can be observed. For both trading partners the value of this indicator increased over the time period due to industries allocated to the AC, CA and CC categories. In 2006 the Grubel-Lloyd indices were around 0.17, because 40% and 8% of all industries were allocated to the CC and AB categories, respectively.

On the contrary trade with the SADC is characterised by a decrease of the overall Grubel-Lloyd index. Whereas in 1992 this indicator was 0.1352, in 2006 it was only 0.0641. This change is due to the high concentration of industries in the AB category (almost 65%). Comparing the two sub periods, most notable are the differences between the AB and AC categories. Whereas the AB category lost 10%-points, the AC category gained 14%-points.

This section showed that the trade policy of the new South Africa managed to open the economy to trade. The change of trade flows over time can be explained by adopting a Heckscher-Ohlin-Samuelson trade model. This section showed that the South African economy mainly specialised in the export of primary products, especially natural resources and metals, which can be found in the rich South African soil. Simultaneously, the imports of manufactures and services increased, as predicted by theory. Whereas generated trade surpluses could cover trade deficits during the 1990s, in the new millennium the increasing demand for machinery, transportation equipment and mineral products has yielded a negative trade balance

6. Conclusion

Overall, this paper shows that South Africa was mainly a supplier of minerals, metals and other natural resources, and agricultural products to the world in 2006. At the same time it imported mostly machines, transportation equipment and minerals such as crude oil. This trade structure resulted in low levels of intra-industry trade, indicated by a low Grubel-Lloyd index. This is also the outcome of other studies dealing with the South African trade structure. A more detailed analysis of the regional trade flows established a significant difference between the CHINAS-group and the SADC on the one hand and the other partners on the other hand. Even though South African governments have tried to build up a competitive domestic manufacturing industry and to diversify exports, trade data displayed rather non-diverse exports. Although a more detailed discussion of all industry aggregates goes beyond the scope of this paper, note that the results of the “transportation” industry aggregate can probably be explained by the effects of the Motor Industry Development Programme.

The analysis of the South African competitiveness showed that 30% of all industries had a revealed comparative advantage in 2006. Whereas this figure for most trading partners remained roughly unchanged, one striking exception was trade with the SADC, i.e. with respect to its neighbouring countries South African industries were highly competitive. This result supports the hypothesis that the South African economy holds a middle position between its industrialised trading partners and emerging developing countries on the one hand and its African neighbours on the other hand. Regarding the former two groups South African competitiveness was mainly based upon factor endowment, resulting in a comparative advantage in primary and lightly processed primary production. As to the SADC the comparative advantage within these industries is relative low, which is, in my opinion, due to the similar factor endowment of the neighbouring countries. Therefore the displayed competitiveness of the South African manufacturing industries is probably caused by higher factor productivity.

Section 5 reported on the liberalisation of South African trade (e.g. import and export growth and decrease of the number of import lines) and the structural change of trade flows over time. Therefore a relationship between the change of trade flows on the one hand and the Grubel-Lloyd index and the RCA-values on the other hand was established. Without any

doubt trade specialisation both on the overall and the regional disaggregated levels took place between 1992 and 2006. Furthermore the Grubel-Lloyd index remained during the observed period rather low.

Based on these findings one can justify the use of a Heckscher-Ohlin-Samuelson trade model to describe the gains of trade for South Africa and to analyse the effect of trade liberalisation. Further research should concentrate on building this theoretical framework and to apply this model on the empirical data. For this purpose one should use an industry classification that differentiates between the factor intensity of production, rather than the one used in this paper.

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