Dokuz Eylül Üniversitesi
Sosyal Bilimler Enstitüsü Dergisi
Cilt: 12, Sayı: 2, Yıl: 2010, Sayfa:107-139
ISSN: 1302 - 3284

Yayın Geliş Tarihi: 07.07.2010
Yayına Kabul Tarihi: 13.09.2010

TURKEY'S COMPETITIVENESS IN THE EU MARKET: A COMPARISON OF DIFFERENT TRADE MEASURES*

Nevzat ŞİMŞEK*
Dilek SEYMEN**
Utku UTKULU***

Abstarct

The paper basically explores the competitiveness of the Turkish industries in the EU Market by employing different trade measures such as the Balassa's Revealed Comparative Advantage Index (RCA), Vollrath's Revealed Competitiveness Index, Grubel-Lloyd Index, and Brülhart B Marginal Intra-Industry Trade Index. The main drawback of the existing empirical literature is that various RCA indices are widely used to explain the competitiveness of a country. This paper however not only focuses on various RCA indices but some additional and complementary measures of competitiveness are also applied since they underline different aspects/dimensions of competitiveness.

Consistency of the results of various trade measures are then compared by using the Sperman Rank Correlation and Kruskal Wallis tests. Based on the empirical results, some policy implications are drawn.

Keywords: Competitiveness, Different trade measures, Consistency

***JEL Classification*:** F14

I. INTRODUCTION

The paper examine the relative competitiveness of the Turkish firms and compare the patterns of specialisation in trade *vis-à-vis* the EU by employing different trade measures such as the Balassa's Revealed Comparative Advantage (RCA) Index, Vollrath's Revealed Competitiveness Index (VRC), Trade Entropy Index (TE), Grubel-Lloyd Index (G-L), and Brülhart B Marginal Intra-Industry Trade Index (Brülhart-B). The main drawback of the existing empirical literature is that various RCA indices are widely used to explain the competitiveness of a country. The definition and empirical adaptation of RCA indices are however

* Assistant Professor of Economics, Dokuz Eylül University, Economics Department, Izmir, e.mail: nevzat.simsek@deu.edu.tr
** Assistant Professor of Economics, Dokuz Eylül University, Economics Department, Izmir, e.mail: dilek.seymen@deu.edu.tr
*** Professor of Economics, Dokuz Eylül University, Economics Department, Izmir, e.mail: utku.utkulu@deu.edu.tr

subject to some controversies. Thus the paper in hand focuses not only in various RCA indices but some additional and complementary measures of competitiveness are also applied since they underline different aspects/dimensions as regards competitiveness. Consistency of the results of various trade measures are then compared by using the Sperman Rank Correlation and Kruskal Wallis tests.

The plan of the paper is as follows. The following section focuses on the measurement of competitiveness by reviewing different trade measures. Section 3 outlines the trade relations between Turkey and the EU. Section 4 reports the data and the empirical findings. The final section draws some conclusions and policy implications.

II. ON THE TRADE MEASURES OF COMPETITIVENESS: A SELECTIVE REVIEW

In recent years, trade theories and their empirical practices have followed two main directions. First, "inter-industry trade" (based on comparative advantage) represented by the Heckscher-Ohlin (H-O) model, and second, "intra-industry trade" represented by the New Trade Theory. The H-O model relies on factor endowment differences to explain trade. Recent years have witnessed the modification of the H-O by dropping some of its simplifying assumptions and acknowledging differences in consumption, productivity, production technology, multiple cones of trade, and factor price differences. What if factor endowments of the trading countries are similar? The line of "intra-industry trade" assumes various forms of imperfect competition with production differentiation, economies of scale, consumer preferences, trade mark, and consequent specialization. There is little doubt that the two lines of models (i.e. inter-industry versus intra-industry trade models) are not rival but complementary.

Taking the above introductory information into consideration, trade measures are preferred to be divided into three categories in this paper, namely i) *measure of concentration/dispersion of trade flows,* ii) *trade measures of inter-industry trade, and* iii) *trade measures of intra-industry trade.*

i) *Measure of concentration/dispersion of trade flows*: *Trade Entropy Index/ TE*

Whether a country trading with others is considered to be deeply integrated with these countries or not is an important matter. Thus TE index is employed to measure the concentration or dispersion of the trade flow of the country in hand (Turkey in this article). As regards the empirics of the TE in this article, we are interested in the level of trade integration of Turkey in to the EU. This level of integration will be the starting point of deeper and detailed empirical analysis of trade measures of inter-industry trade and intra-industry trade (Laaser and Schrader, 2002: 17).

The equations used to calculate (absolute) trade entropy index (TE) of import and export are as follows[1]:

$$TE_{mi} = \sum_j a_{ij} \ln (1/a_{ij}) \quad \text{with } 0<a_{ij}< 1 \text{ and } \sum_j a_{ij}=1 \qquad (1)$$

$$TE_{xi} = \sum_j b_{ij} \ln (1/b_{ij}) \quad \text{with } 0<b_{ij}< 1 \text{ and } \sum_j b_{ij}=1 \qquad (2)$$

where a_{ij} and b_{ij} represent the import and export shares of country i from country j and country i to country j respectively. The lower the index the less dispersed is the export (or import) of that country. In other words, the lower the index the more concentrated is the export (or import) of that country. Accordingly, a country with low concentration is regarded being well integrated in to the world trade, while a country with a high concentration implies that country's trade is restricted to a small number of trade partners (Laaser and Schrader, 2002:17).

ii) ***Trade measures of inter-industry trade: RCA, RC***

As an inter-industry trade measure, we include in the study, Balassa's original and revised Revealed Comparative Advantage/ RCA indices (Balassa, 1965) and Vollrath's Revealed Competitiveness Index (RC) (Vollrath, 1991):

- **Balassa's Revealed Comparative Advantage Index/ RCA**

According to the H-O theory, a country's comparative advantage is determined by its relative factor scarcity. However, it is well known that measuring comparative advantage and testing the Hecksher-Ohlin (H-O) theory have some difficulties (Balassa, 1989: 42-4) since relative prices under autarky are not observable. Given this fact, Balassa (1965) proposes[2] that it may not be necessary to include all constituents effecting country's comparative advantage. Instead, he suggests that comparative advantage is revealed by observed trade patterns, and in line with the theory, one needs pre-trade relative prices which are not observable. Thus, inferring comparative advantage from observed data is named "revealed" comparative advantage (RCA). In practice, this is a commonly accepted method to analysing trade data.

Balassa (1965) derives an index[3] (called the Balassa Index, i.e. RCA in this paper) that measures a country's comparative advantage. The Balassa index tries to identify whether a country has a "revealed" comparative advantage rather than to determine the underlying sources of comparative advantage. However, since first suggested by Balassa (1965), the definition of RCA has been revised and modified such that an excessive number of measures now exist.

[1] See Marwah and Klein (1995).
[2] See also Balassa (1977).
[3] Before Balassa introduced his famous RCA index in 1965, Liesner (1958) had already contributed to the empirical literature of RCA. In this sense, Liesner (1958) is the first empirical study in the literature of RCA. The proposed simple measure of RCA by Liesner is as follows: RCA = Xij / Xnj

The original RCA index of Balassa is as follows[4]:

$$RCA_1 = CEP = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}) = (X_{ij} / X_{nj}) / (X_{it} / X_{nt}) \quad (3)$$

where X represents exports, i is a country, j is a commodity (or industry), t is a set of commodities (or industries) and n is a set of countries. RCA_1 measures a country's exports of a commodity (or industry) relative to its total exports and to the corresponding exports of a set of countries, e.g. the EU. A comparative advantage is "revealed", if $RCA_1 > 1$. If RCA_1 is less than unity, the country is said to have a comparative disadvantage in the commodity / industry. It is argued that the RCA_1 index is biased due to the omission of imports especially when country-size is important (Greenaway and Milner, 1993).

An alternative RCA index is computed in order to make reference to the "own" country trade performance only. This type of measurement of a country's RCA recognizes the possibility of simultaneous exports and imports within a particular commodity / industry.

$$RCA_2 = (X_{ij} - M_{ij}) / (X_{ij} + M_{ij}) \quad (4)$$

In the case of Equation 4, the index ratio ranges from -1 (*Xij* = 0 and revealed comparative disadvantage) to +1 (*Mij* = 0 and revealed comparative advantage). However, regarding RCA_2, there exist ambiguities around zero values (Greenaway and Milner, 1993)[5].

One can derive another version of RCA from Balassa (1965). The equation is as follows:

$$RCA_3 = (X_{ij} / X_{it}) / (M_{ij} / M_{it}) = (X_{ij} / M_{ij}) / (X_{it} / M_{it}) \quad (5)$$

where *X* and *M* represents exports and imports respectively. *i* is a country, *j* is a commodity (or industry), *t* is a set of commodities (or industries). A similar version of Equation 4 derived from Balassa (1965) is the following:

$$RCA_4 = \ln (X_{ij} / X_{it}) / (M_{ij} / M_{it}) *100 = \ln (X_{ij} / M_{ij}) / (X_{it} / M_{it}) *100 \quad (6)$$

- **Vollrath's Revealed Competitiveness Index (RC)**

Vollrath (1991) offered mainly three alternative ways of measurement of a country's RCA. These alternative specifications of RCA are called *the relative trade advantage* (RTA), *the logarithm of the relative export advantage* (ln RXA), and *the revealed competitiveness* (RC). In this study, for the sake of being systematic, we call them as VRC_1, VRC_2, and VRC_3 respectively. It is clear that the advantage of presenting latter two indices (i.e. VRC_2 and VRC_3) is that they become symmetric through the origin. Positive values of Vollrath's three alternative measures of revealed comparative advantage reveal a

[4] In the relevant literature some studies (e.g. Yılmaz and Ergun, 2003; Yılmaz, 2002; Erlat and Erlat, 2005; Akgüngör *et.al.* 2002) name the original Balassa RCA index, i.e. RCA_1 here, as the Comparative Export Performance Index (CEP). These two indices are identical. Thus in this paper we employ RCA_1 only.

[5] This index shows the share of inter-industry trade within the total trade.

comparative/competitive advantage whereas negative values indicate comparative /competitive disadvantage.

However, a problem of implementing these or similar RCA indices is that real (observed) trade patterns may be distorted by government interventions, thus causing misrepresentation of underlying comparative advantage. It is thus a concern that import restrictions, export subsidies and other protectionist policies of governments, to an extent, may distort RCA indices. Fertö and Hubbard (2003), in this respect, uses nominal assistance coefficients (NACs) estimated by the OECD by country and commodity to filter the effects of possible distortions in measuring Hungarian Agri-food sector RCAs vis-à-vis the EU. Greenaway and Milner (1993), on the other hand, suggests the employment of a price-based measure of RCA called "implicit revealed comparative advantage" to get rid of the distortion caused by the post-policy intervention.

Vollrath (1991) suggests that the RC index (VRC3 in the present paper) is preferable since supply and demand balance embodied in the index. Evaluating the shortcomings of Vollrath's three indices, Vollrath acknowledges that the RXA (relative export advantage) index which reduces the distortion effects is more commonly used in practice.

The relative trade advantage (RTA) (here VRC_1) is calculated as the difference between *relative export advantage* (RXA), which is the equivalent to the original Balassa index (RCA_1), and its counterpart, *relative import advantage* (RMA). It is important to note that the main difference of Vollrath's RXA from Balassa's original RCA_1 index is that it prevents from double-counting. In the present paper, the indices used are hybrids, in that the set of countries (n) is restricted to the EU whereas the set of commodities (t) refers to all trade.

$$VRC_1 = RTA = RXA - RMA$$

where $RXA = RCA_1 = CEP = (X_{ij}/ X_{it}) / (X_{nj}/ X_{nt})$ and $RMA = (M_{ij}/ M_{it}) / (M_{nj}/ M_{nt})$

where *M* accounts for imports. In consequence;

$$VRC_1 = RTA = RXA - RMA = (X_{ij}/ X_{it}) / (X_{nj}/ X_{nt}) - (M_{ij}/ M_{it}) / (M_{nj}/ M_{nt}) \quad (7)$$

Vollrath's second RCA measure is the logarithm of the relative export advantage (here as VRC_2):

$$VRC_2 = \ln RXA = \ln RCA_1 = \ln CEP \quad (8)$$

The third measure of Vollrath is the revealed competitiveness (RC) (here as VRC_3), expressed as:

$$VRC_3 = RC = \ln RXA - \ln RMA \quad (9)$$

Given that there exists a range of RCA alternative indices suggested and employed in the literature to measure comparative advantage, some inconsistent results may occur obtained by the use of different RCA indices. Interpretation of the RCA indices in the ordinal or cardinal senses is another field of dispute.

Furthermore, the stability and the consistency of alternative measures of RCA have been called into questioned (e.g. Balance et al., 1987; Yeats, 1985; Hinloopen and Van Marrewijjk, 2001). It is therefore encouraged that the policy makers need cautious interpretation of RCA indices by especially underlining probabilities of revealing a comparative advantage or disadvantage.

iii) ***trade measures of intra-industry trade***

(Greenaway and Milner, 1986), ie. Trade Overlap Index, TO (Finger, 1975; Finger and de Rosa, 1979) Grubel-Lloyd Index, GL (Grubel and Lloyd, 1975) and Brülhart B Marginal Intra-Industry Trade Index, Brülhart-B (Brülhart, 1994).

Trade measures of intra-industry trade show, to what extent, intra-industry specialization exists. In this paper, the trade measure named RCA_2 is employed as an indicator for competitiveness. When similar logic is applied, measurement of intra-industry trade also shows the competitiveness. As the share of the intra-industry trade in the total trade decreases, competitiveness at this industry increases. Various measures of intra-industry trade have been offered in the literature. In this paper, we employ the most well-known and employed measures.

- **Grubel-Lloyd Index/ G-L and Trade Overlap Index/ TO**

$$G\text{-}L = 1 - (|X_i - M_i| / X_i + M_i) \quad (10)$$

where X_i and M_i are exports and imports of industry i (Grubel and Lloyd, 1975). This measure is equivalent to the trade overlap index (TO) offered by Finger (1975):

$$TO = 2 \min (X_i,M_i) / (X_i + M_i) \quad (11)$$

Both GL and TO approach +1 as trade becomes balanced, and 0 as either exports or imports dominate. That is, coefficients vary between 0 and +1. A higher coefficient implies that intra-industry specialization exists[6].

- **Brülhart B Marginal Intra-Industry Trade Index/ Brülhart-B**

$$\text{Brülhart-B} = (\Delta X - \Delta M) / |\Delta X| + |\Delta M| \quad (12)$$

The Brülhart-B index takes values between -1 and +1. The index gives information on two dimensions. First, information about the proportion of marginal intra-industry trade (MIIT), and second, country-specific sectoral performance. As regard the first dimension, the closer Brülhart-B is to 0, the higher is MIIT. If Brülhart-B is equal to 0, the marginal trade in the particular industry is purely the intra-industry type, while at both -1 and +1 it shows marginal trade to be purely the inter-industry type. Regarding the second dimension, the definition of the sectoral performance is the change in exports and imports in relation to each other. When Brülhart-B = -1, ΔM was ≥ 0 while ΔX was $\Delta \leq 0$ over the examined period. The

[6] Finger (1975) suggests that the measurements of intra-industry trade stems from misclassification. In a later work with DeRosa, Finger points out that this finding is a "trade overlap" but not intra-industry trade (Finger and DeRosa, 1979). However, in later works the term "trade overlap" an intra-industry trade is used in the same meaning.

opposite is true for Brülhart-B = 1. In other words, when Brülhart-B >0 then this implies that $\Delta X > \Delta M$, and when Brülhart-B<0 then this reflects that $\Delta X < \Delta M$ (Brülhart, 1994; 606-607).

III. TRADE RELATIONS OF TURKEY WITH THE EUROPEAN UNION

As far as the EU is concerned, Turkey is the only country signed the Customs Union (CU) agreement with the EU (in 1996) before the membership. A unique country example of signing the CU without any form of active participation in Brussels, i.e. without full membership. This has led to a trade liberalisation and increased competitive pressure for both sides. Turkey has started negotiations for full-membership with the EU in 2005 after the acknowledgement of country's fulfilment of the pre-conditions by the EU such as the well known "political criteria" on the one hand, and "economic criteria" which includes the establishing of a well-functioning market economy, existence of free and functioning competition (so called the Copenhagen "economic" criteria), on the other. The beginning of negotiations has opened the door of a new era and paved the way for full-membership.

Ten years of experience in the CU has made Turkey, no doubt, more trade liberalized country on the one hand, and more capable of competing in the very competitive EU market. Thus one can easily expect that Turkey is well trade-integrated with the EU as far as any new member country signed in 2004 or 2007[7]. The figures in Table 1 implies that early years of the CU (ie 1996-1998) marked fairly imbalanced trade (due to remarkable increase in imports but almost very slight increase in exports: that is a trade creation effect with one leg is missing!) between Turkey and the EU. 2000-2001 are the years of the most severe economic crisis in the country's history. Turkey's accession to the EU is anticipated by 2020 (see EUECOPOL, 2006). In the meantime, relative competitiveness will play a crucial role in shaping changes in trade flows and patterns between Turkey, members and third countries. It is thus important to explore the trade patterns and trade specialization (Utkulu and Seymen, 2003; Utkulu *et al.* 2004).

Economic relations between two parties have been strong since the early 1950s, but were intensified over recent decades. The long-standing preferences between Turkey and the EU have resulted in the EU being not only the most important market for Turkey (48 per cent of Turkey's exports in 2008) but also one of the main sources for imported goods (37 per cent of Turkey's imports in 2008).

[7] To have more conclusive opinion, see our empirical findings of the Trade Entropy Index / TE.

Table 1: Turkey's Trade Balance and Turkey-The EU Trade Balance (billions of $)

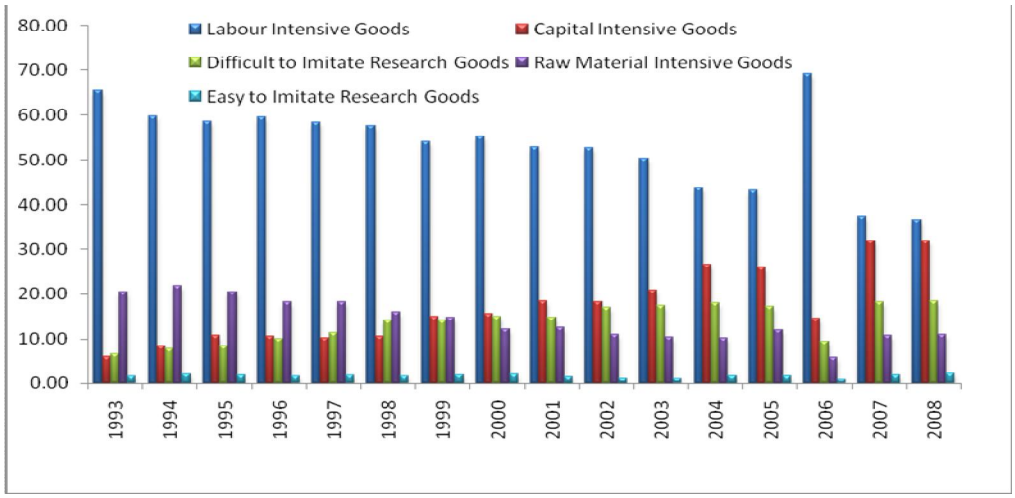
	Turkey's Trade Balance (I) $	X/M Trade Balance (II)	Turkey-the EU (EU) (III) $	X/M from the EU (IV)	Share of deficit originating in the total deficit V = III / I
1995	-14.1	60.5	-5.8	65.7	41.1
1996	-20.4	53.2	-11.6	49.8	56.9
1997	-22.3	54.1	-12.7	49.0	57.0
1998	-18.9	58.8	-10.6	56.0	56.1
1999	-14.1	65.4	-7.1	66.8	50.4
2000	-26.7	51.0	-12.1	54.5	45.3
2001	-10.1	75.6	-2.2	88.0	21.8
2002	-15.2	70.4	-4.6	80.1	30.3
2003	-22.0	68.3	-7.6	77.3	34.5
2004	-34.3	64.8	-11.4	76.0	33.2
2005	-43.3	62.9	-10.6	78.4	24.5
2006	-53.1	61.7	-10.0	81.4	18.8
2007	-62.8	63.1	-8.2	88.0	13.1
2008	-69.9	65.5	-11.4	84.8	6.3

Source: State Planning Organisation and own calculations

Table 1 shows that although Turkey's trade deficit increases, the share of deficit originating from the EU in the total deficit decreases. In the same line, Turkey's X/M ratio to the EU improves (84.8 in 2008) after the 2000 crisis whereas the X/M ratio in average worsens (65.5 in 2008). This implies that Turkey's trade with the EU is not the source of increasing trade deficits. The third countries such as Russia, China and the oil exporting countries are the main source or Turkey's imbalanced trade and worsening trade deficits. Table 1 as a whole reflects the success story of the economic integration process started with the CU in 1996. In the early years, trade creation effects were due to boosting Turkish imports from the EU, and this was fairly imbalanced. In time Turkish exporters have seemed to learn to compete with the European partners and with the firms exporting to the EU from the third countries. Table 1 gives a satisfactory impression that in the years of new millenium Turkey has established a well-functioning market economy and the existent of free and functioning competition within the EU (so called the Copenhagen "economic" criteria).

Figure 1 and 2 give the shares of Turkey's exports to and imports from the EU for the period 1993-2008. To be consistent with the empirical work employed in the next section, exports and imports are divided into five categories, namely, labour intensive goods, capital intensive goods, raw material intensive goods, easy to imitate research intensive goods, and difficult to imitate research intensive goods.

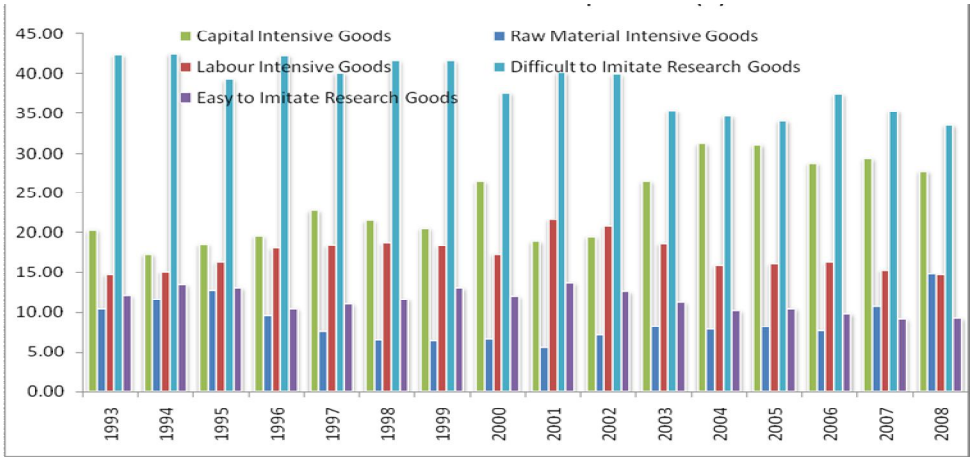
Figure 1: Sectoral Share of Turkey's Exports to the EU (%)



Source: Turkish Statistical Institute (TURKSTAT)

Figure 1 provides a clear evidence of gradual and sustainable move from exporting labour intensive goods to capital intensive and research intensive goods especially in the new millennium. This can be considered as a transformation from a country exporting lower value-added products to country higher value-added products. This is a remarkable change in the export composition of the country.

Figure 2: Sectoral Share of Turkey's Exports to the EU (%)



Source: Turkish Statistical Institute (TUKSTAT)

Figure 2 reveals that Turkey's major category of imports from the EU for the period 1993-2008 are the difficult to imitate research intensive goods and the capital intensive goods. There has been a slight decrease in the imports of difficult

to imitate research intensive goods and slight increase in the imports of capital intensive goods after 2002.

IV. DATA AND EMPIRICAL FINDINGS

The data used in the empirical calculations covers the period 1993-2008. It is a classified sectoral data which includes labour intensive goods, capital intensive goods, raw material intensive goods, easy to imitate research intensive goods, and difficult to imitate research intensive goods[8]. The data used is annual with three-digits compatible with the Standard International Trade Classification (SITC), taken from the database of the ITCS (International Trade by Commodity Statistics), and from the TURKSTAT. 248 different industries at the three-digit level (62 labour intensive, 37 capital intensive, 77 raw material intensive, 22 easy to imitate research intensive, 50 difficult to imitate research intensive industries) are employed in the calculation[9].

A. Findings of Trade Entropy Index

As regards the empirics of the TE in this article, we are interested in the level of integration of Turkey in to the EU. This level of integration will be the starting point of deeper and detailed empirical analysis of trade measures of inter-industry trade and intra-industry trade.

Table 2: Trade Entropy Index / TE Calculation Results of Turkey to the EU

Years	TE_{xi}	RTE_{xi}	TE_{mi}	RTE_{mi}
1993	1,649	(0,69)	1,818	(0,76)
1994	1,701	(0,71)	1,834	(0,77)
1995	1,839	(0,70)	2,042	(0,77)
1996	1,862	(0,71)	2,016	(0,76)
1997	1,918	(0,73)	2,068	(0,78)
1998	1,972	(0,75)	2,109	(0,80)
1999	2,014	(0,76)	2,186	(0,83)
2000	2,055	(0,78)	2,194	(0,83)
2001	2,081	(0,79)	2,128	(0,81)
2002	2,100	(0,80)	2,123	(0,80)
2003	2,141	(0,81)	2,123	(0,80)
2004	2,398	(0,75)	2,352	(0,74)
2005	2,442	(0,77)	2,384	(0,75)
2006	2,481	(0,78)	2,384	(0,75)
2007	2,641	(0,81)	2,535	(0,78)
2008	2,655	(0,82)	2,555	(0,78)

Source: own calculations

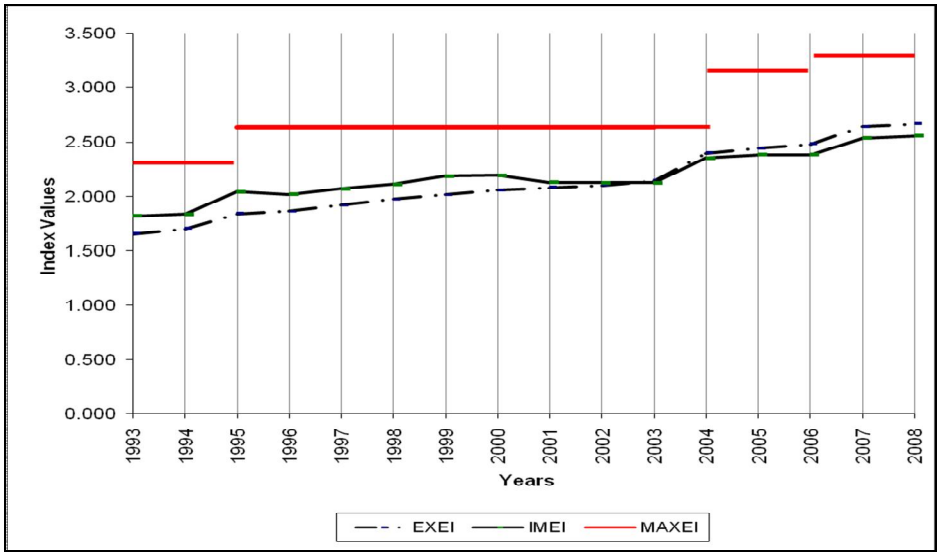
[8] This classification also used by Yılmaz (2002) and Erlat and Erlat (2005) is based on Hufbauer and Chilas (1974). For details of this classification see the App. A.

[9] The detailed results of three-digit industries can be obtained from authors.

Table 2 reveals higher concentration (less dispersion) in the early 1990s for Turkey in the EU market. The relevant TE figures also point out that there exists a continuous increase in the dispersion especially evident after the CU agreement. According to TE indices reported in Table 2, Turkey seems to be integrated in the EU market. Turkey showed a considerable increase in its import entropy index, TE_{mi}, which might be a result of the CU especially after 1996 (Yılmaz and Ergun: 2003 pp.5-7)

Relative entropy ratios (RTE) (reported in parentheses) which calculated based on the maximum entropy ratios seem to be reasonably reliable indicators in examining the level of the country's trade integration with the EU. RTE_{xi} and RTE_{mi} figures in Table 2 reach the highest share (as 80 %) in 2003. 2004 however marks the joining of ten new members to the EU which lowers the RTEs although absolute entropi ratios (RTE_{xi} and $RTE_{mi)}$ continued to increase. In Figure 3, the red line shows the calculated $TE_{max.}$ The increasing entropy indicators obviously imply the increasing degree of integration of Turkey into the European division of labour in the last decade. At least it looks fair to come to a point where Turkey has reached a fair degree of trade distribution although trade appears to be concentrated to a certain degree.

Figure 3: Graphs of TE_{xi}, TE_{mi}, and TE_{max}



B. Findings of Trade Measures and Competitiveness in the Raw Materials Intensive Goods

In the aggregate level, all indices in Table 3 reveal comparative/competitive advantage (RCA/RC) for the full period. G-L index give results in favour of inter-industry type of trade at raw material intensive industries.

Brülhart-B index is also confirmative in the sense that change in trade within this group is import-oriented resulting a decrease in the Turkey's competitiveness (-0,48 for the period 1993-2008).

Table 3: Raw Materials Intensive Goods: Aggregated Findings for Turkey to the EU

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
RCA1 (CEP)	1,6	1,6	2,3	2,2	2,2	2,3	2,1	1,6	1,8	1,6	1,6	1,4	1,6	1,1	1,1	1,0
RCA2	0,1	0,2	0,0	0,0	0,1	0,2	0,2	0,0	0,4	0,1	0,0	0,0	0,1	0,1	0,0	-0,2
RCA3	2,0	2,0	1,7	2,0	2,5	2,6	2,4	2,0	2,4	1,7	1,4	1,4	1,6	0,8	1,1	0,8
RCA4	0,7	0,7	0,5	0,7	0,9	0,9	0,9	0,7	0,9	0,5	0,3	0,4	0,5	-0,2	0,1	-0,2
VRC1	0,5	0,3	1,3	1,3	1,4	1,4	1,0	0,6	0,9	0,7	0,7	0,7	0,9	0,1	0,0	-0,1
VRC2	0,4	0,5	0,8	0,8	0,8	0,8	0,7	0,5	0,6	0,5	0,5	0,4	0,5	0,1	0,1	0,0
VRC3	0,3	0,2	0,8	0,8	0,9	0,9	0,7	0,5	0,7	0,5	0,6	0,7	0,8	0,1	0,0	-0,1
G-L	0,9	0,8	1,0	1,0	0,9	0,8	0,8	1,0	0,6	0,9	1,0	1,0	0,9	0,9	1,0	0,8
Brülhart B	-0,3			-0,5												
	-0,5															

Source: own calculations

Analyzed at the three-digit disaggregated level, when RCA1 is taken into consideration, 22 out of 77 (28.2 %) sub-sectors (Raw Materials intensive industries) reveals comparative advantage in 2008 (see Table 4). This number has decreased slightly from 27 in 1993 (34,6 %) to 22 (28.2 %) in 2008. According to RCA3, VRC1 and VRC3 indices, the number of sectors revealing competitive advantages rises considerably over 40 % in 2008[10].

[10] See also App. B for detailed analysis of the three digit industry level.

Table 4: Raw Materials Intensive Goods: Disaggregated Findings for Turkey to the EU– at the three digit level

	RCA1 (CEP)-VRC2		RCA2-GL		RCA3-RCA4		VRC1-VRC3	
	Ind.	%	Ind.	%	Ind.	%	Ind.	%
1993	27	34,6	30	38,5	32	41,0	37	47,4
1994	27	34,6	33	42,3	32	41,0	42	53,8
1995	31	39,7	30	38,5	32	41,0	37	47,4
1996	28	35,9	29	37,2	34	43,6	36	46,2
1997	32	41,0	25	32,1	32	41,0	41	52,6
1998	34	43,6	30	38,5	30	38,5	38	48,7
1999	32	41,0	29	37,2	31	39,7	34	43,6
2000	31	39,7	29	37,2	30	38,5	39	50,0
2001	31	39,7	37	47,4	33	42,3	39	50,0
2002	30	38,5	35	44,9	33	42,3	38	48,7
2003	31	39,7	36	46,2	36	46,2	37	47,4
2004	29	37,2	32	41,0	31	39,7	35	44,9
2005	31	39,7	34	43,6	32	41,0	40	51,3
2006	24	30.8	35	44.9	27	34.6	43	55.1
2007	23	29.5	35	44.9	32	41.0	42	53.8
2008	22	28.2	34	43.6	32	41.0	38	48.7

Source: own calculations

C. Findings of Trade Measures and Competitiveness in the Labour Intensive Goods

In aggregate level all indices show that Turkey have comparative advantage (RCA) for full period (see Table 5). G-L index suggest that sectors in this group transforms to intra-industry type in the period. Burkhart B index also reveals evidence confirming that increase/ change in the trade between Turkey and the EU on labour intensive goods is export-oriented. This result implies that sectors having RCA/RC increase their competitive powers. This rise continuous even after the CU agreement at relatively lower pace.

Table 5: Labour Intensive Goods: Aggregated Findings for Turkey to the EU

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
RCA1 (CEP)	2,1	2,1	2,3	2,3	2,4	2,5	2,4	2,5	2,4	2,4	2,4	2,3	2,3	2,1	2,0	1,8
RCA2	0,4	0,5	0,4	0,3	0,2	0,3	0,4	0,3	0,4	0,4	0,4	0,4	0,4	0,8	0,4	0,4
RCA3	4,6	4,1	3,8	3,5	3,3	3,2	3,1	3,4	2,7	2,8	3,0	3,0	2,9	4,7	2,6	2,7
RCA4	1,5	1,4	1,3	1,2	1,2	1,2	1,1	1,2	1,0	1,0	1,1	1,1	1,1	1,5	1,0	1,0
VRC1	1,5	1,4	1,6	1,6	1,7	1,8	1,7	1,8	1,6	1,6	1,7	1,6	1,6	1,3	1,2	1,1
VRC2	0,7	0,7	0,8	0,8	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,8	0,8	0,7	0,7	0,6
VRC3	1,3	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,1	1,2	1,2	1,2	1,2	1,0	0,9	0,9
G-L	0,6	0,5	0,6	0,7	0,8	0,7	0,6	0,7	0,6	0,6	0,6	0,6	0,6	0,2	0,6	0,6
Brülhart B	0,4			0,3												
	0,2															

Source: own calculations

When the original Balassa index (RCA1) is considered, 33 out of 62 sub-sectors (within the labour intensive industry) reveal comparative advantage (53.2 %) in 2008. This number has increased from 26 to 33 in 2008, showing the increasing number of sub-sectors having comparative advantage. There exists regular and consistent increase through the period 1993-2008. If RCA3-4 is examined instead of RCA1, 34 out of 62 sub-sectors (54.8 %) reveal comparative advantage in 2005. Accordingly all RCA indices are consistent with each other.

However, VRC1 and VRC3 indices of Vollrath points out slightly different outcome. Although the number of sectors revealing competitive advantages is still same (54.8 % in 2007 and 1994), there has been a slight fall when the figures of 1994 and 2008 are compared.

Table 6 presents the results of three-digit level disaggregated data for labour intensive industries to be able to get rid of the well-known drawbacks of using aggregated data.

Table 6: Labour Intensive Goods: Disaggregated Findings for Turkey to the EU – at the three digit level

	RCA1 (CEP)-VRC2		RCA2-GL		RCA3-RCA4		VRC1-VRC3	
	Ind.	%	Ind.	%	Ind.	%	Ind.	%
1993	26	41,9	28	45,2	29	46,8	34	54,8
1994	26	41,9	28	45,2	30	48,4	35	56,5
1995	26	41,9	24	38,7	27	43,5	34	54,8
1996	28	45,2	24	38,7	28	45,2	32	51,6
1997	28	45,2	24	38,7	26	41,9	34	54,8
1998	30	48,4	23	37,1	28	45,2	33	53,2
1999	30	48,4	24	38,7	27	43,5	32	51,6
2000	31	50,0	26	41,9	28	45,2	35	56,5
2001	32	51,6	27	43,5	27	43,5	36	58,1
2002	31	50,0	27	43,5	27	43,5	33	53,2
2003	32	51,6	27	43,5	30	48,4	35	56,5
2004	33	53,2	30	48,4	32	51,6	36	58,1
2005	36	58,1	31	50,0	33	53,2	33	53,2
2006	33	53.2	26	41.9	23	37.1	35	56.5
2007	33	53.2	29	46.8	35	56.5	34	54.8
2008	33	53.2	33	53.2	34	54.8	32	51.6

Source: own calculations

D. Findings of Trade Measures and Competitiveness in the Capital Intensive Goods

In the aggregate level, findings of RCA1 (CEP) seem to be different from the other RCA indices. RCA1 shows comparative advantages for the capital intensive industries in the aggregate level after 1995 period while other RCA indices such as RCA2, RCA3, and RCA4 reveals no comparative advantage for Turkey until 2007. Volrath's VRC indices of revealed competitiveness also present evidence against revealed competitiveness until 2006.

G-L index provides evidence confirming that starting from 1998 capital intensive goods trade with the EU has been intra-industry type. Brülhart-B index confirms that change in trade at this industry after 1995, i.e. in the CU era, has been export-oriented resulting a slight increase in the country's competitiveness (0.08 during the period 1995-2008).

Table 7: Capital Intensive Goods: Aggregated Findings for Turkey to the EU

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
RCA1 (CEP)	1,0	0,9	1,0	1,1	1,0	0,9	1,1	1,1	1,2	1,2	1,2	1,5	1,4	1,3	1,3	1,5
RCA2	-0,7	-0,4	-0,4	-0,6	-0,6	-0,5	-0,3	-0,5	0,0	-0,1	-0,2	-0,2	-0,2	-0,1	0,0	0,0
RCA3	0,3	0,5	0,6	0,6	0,5	0,5	0,8	0,6	1,1	1,0	0,9	0,9	0,9	0,6	1,2	1,3
RCA4	-1,2	-0,7	-0,5	-0,6	-0,8	-0,7	-0,3	-0,5	0,1	0,0	-0,1	-0,1	-0,1	-0,6	0,2	0,2
VRC1	-0,1	0,1	-0,4	-0,5	-0,8	-0,7	-0,5	-0,8	-0,7	-0,5	-0,8	-0,5	-0,6	0,2	0,3	0,4
VRC2	0,0	-0,1	0,0	0,1	0,0	-0,1	0,1	0,1	0,2	0,2	0,2	0,4	0,3	0,2	0,3	0,4
VRC3	-0,1	0,2	-0,3	-0,4	-0,6	-0,5	-0,4	-0,6	-0,4	-0,3	-0,5	-0,3	-0,3	0,2	0,3	0,3
G-L	0,3	0,6	0,6	0,4	0,4	0,5	0,7	0,5	1,0	0,9	0,8	0,8	0,8	0,9	1,0	1,0
Brülhart B	1,0			0,1												
	0,1															

Source: own calculations

Examined at the three-digit disaggregated level, more detailed and perhaps different findings are found. It is now possible to see and clarify which sub-industries have competitive power. Although the aggregated data shows comparative disadvantage, the real story might be the opposite for a specific sub-industry or vice versa.

Table 8: Capital Intensive Goods: Disaggregated Findings for Turkey to the EU– at the three digit level

	RCA1 (CEP)-VRC2		RCA2-GL		RCA3-RCA4		VRC1-VRC3	
	Ind.	%	Ind.	%	Ind.	%	Ind.	%
1993	11	29,7	5	13,5	5	13,5	11	29,7
1994	11	29,7	7	18,9	9	24,3	12	32,4
1995	14	37,8	8	21,6	11	29,7	13	35,1
1996	15	40,5	7	18,9	9	24,3	14	37,8
1997	16	43,2	8	21,6	12	32,4	12	32,4
1998	14	37,8	10	27,0	13	35,1	13	35,1
1999	16	43,2	9	24,3	13	35,1	9	24,3
2000	16	43,2	6	16,2	16	43,2	12	32,4
2001	15	40,5	16	43,2	18	48,6	11	29,7
2002	17	45,9	11	29,7	13	35,1	12	32,4
2003	16	43,2	9	24,3	12	32,4	10	27,0
2004	18	48,6	9	24,3	12	32,4	12	32,4
2005	17	45,9	11	29,7	13	35,1	12	32,4
2006	14	37.8	12	32.4	6	16.2	18	48.6
2007	12	32.4	13	35.1	16	43.2	17	45.9
2008	13	35.1	14	37.8	17	45.9	17	45.9

Source: own calculations

When RCA1 is taken into consideration, 11 out of 37 sub-sectors (within the capital intensive industry) reveal comparative advantage (29.7 %) in 1993. This number has increased from 11 to 13 in 2008 (35.1 %) showing the increasing number of sub-sectors having comparative advantage. If RCA3 is examined instead of RCA1, 5 out of 37 sub-sectors (13.5 %) reveals comparative advantage in 1993 whereas number of sectors with comparative advantage increases to 17 (45.9 %). According to VRC1 and VRC3 indices, the number of sectors revealing competitive advantages increases moderately from 11 in 1993 (29.7 %) to 17 in 2008 (45.9 %).

E. Findings of Trade Measures and Competitiveness in the Easy to Imitate Research Intensive Goods

In the aggregate level, all indices in Table 9 show revealed comparative/competitive disadvantage (RCD). In addition, G-L index suggests that there is an inter-industry structure in the trade of easy to imitate research intensive goods between Turkey and the EU. Brülhart-B index also confirms that change in trade at this industry after 1995, ie in the CU era, has been import-oriented resulting a decrease in the country's competitiveness (-0.59 during the period 1995-2008).

Table 9: Easy to Imitate Research Intensive Goods: Aggregated Findings for Turkey to the EU

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
RCA1 (CEP)	0,3	0,2	0,3	0,2	0,3	0,4	0,3	0,4	0,3	0,4	0,4	0,5	0,4	0,4	0,4	0,3
RCA2	-0,8	-0,7	-0,7	-0,8	-0,7	-0,6	-0,7	-0,7	-0,5	-0,4	-0,4	-0,3	-0,3	-0,3	-0,4	-0,4
RCA3	0,2	0,2	0,2	0,3	0,4	0,4	0,3	0,4	0,3	0,6	0,6	0,7	0,7	0,3	0,5	0,5
RCA4	-1,4	-1,4	-1,4	-1,3	-1,0	-0,9	-1,2	-1,0	-1,1	-0,6	-0,5	-0,3	-0,4	-1,1	-0,6	-0,7
VRC1	-0,4	-0,6	-0,6	-0,5	-0,5	-0,4	-0,6	-0,6	-0,4	-0,3	-0,3	-0,2	-0,2	-0,3	-0,3	-0,3
VRC2	-1,2	-1,4	-1,4	-1,4	-1,3	-1,0	-1,1	-1,0	-1,1	-0,9	-0,9	-0,8	-0,8	-0,9	-1,0	-1,1
VRC3	-0,9	-1,2	-1,2	-1,1	-1,0	-0,7	-1,0	-0,9	-0,8	-0,5	-0,5	-0,3	-0,4	-0,5	-0,6	-0,7
G-L	0,2	0,3	0,3	0,2	0,3	0,4	0,3	0,3	0,5	0,6	0,6	0,7	0,7	0,7	0,6	0,6
Brülhart B	-0,7			-0,5												
	-0,5															

Source: own calculations

Examined at the three-digit disaggregated level, when RCA1 is taken into consideration, 3 out of 26 sub-sectors reveals comparative advantage in 2008 (see Table 10). According to VRC1 and VRC3 indices, the number of sectors revealing competitive advantages has changed between 1 and 4 during the period showing very limited number of sub-sectors having comparative advantage.

Table 10: Easy to Imitate Research Intensive Goods: Disaggregated Findings for Turkey to the EU – at the three digit level

	RCA1 (CEP)-VRC2		RCA2-GL		RCA3-RCA4		VRC1-VRC3	
	Ind.	%	Ind.	%	Ind.	%	Ind.	%
1993	3	11,5	2	7,7	3	11,5	4	15,4
1994	2	7,7	2	7,7	3	11,5	3	11,5
1995	2	7,7	1	3,8	2	7,7	1	3,8
1996	2	7,7	1	3,8	2	7,7	2	7,7
1997	2	7,7	1	3,8	2	7,7	3	11,5
1998	2	7,7	1	3,8	2	7,7	3	11,5
1999	4	15,4	2	7,7	3	11,5	3	11,5
2000	3	11,5	1	3,8	3	11,5	3	11,5
2001	3	11,5	1	3,8	1	3,8	1	3,8
2002	3	11,5	1	3,8	1	3,8	1	3,8
2003	3	11,5	1	3,8	1	3,8	2	7,7
2004	4	15,4	2	7,7	3	11,5	3	11,5
2005	4	15,4	3	11,5	3	11,5	4	15,4
2006	3	11,5	2	7,7	1	3,8	3	11,5
2007	3	11,5	3	11,5	4	15,4	3	11,5
2008	3	11,5	2	7,7	4	15,4	4	15,4

Source: own calculations

F. Findings of Trade Measures and Competitiveness in the Difficult to Imitate Research Intensive Goods

In the aggregate level, all indices in Table 11 show revealed comparative/competitive disadvantage (RCA/RC). G-L index results underline the fact that there has been inter-industry type trade at this sector group until 2000, though one can observe intra-industry type transformation 2000 onwards. Brülhart-B index is also confirmative in the sense that change in trade within this group is import-oriented resulting a decrease in the Turkey's competitiveness.

Table 11: Difficult to imitate Research Intensive Goods: Aggregated Findings for Turkey to the EU

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
RCA1 (CEP)	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,4	0,3	0,4	0,4	0,4	0,6	0,6	0,6
RCA2	-0,9	-0,8	-0,8	-0,8	-0,8	-0,7	-0,6	-0,7	-0,6	-0,6	-0,6	-0,5	-0,6	-0,5	-0,4	-0,4
RCA3	0,1	0,2	0,2	0,2	0,2	0,3	0,3	0,4	0,3	0,3	0,4	0,4	0,4	0,2	0,5	0,5
RCA4	-2,1	-1,8	-1,6	-1,5	-1,4	-1,3	-1,1	-1,0	-1,1	-1,2	-1,0	-1,0	-1,0	-1,6	-0,8	-0,6
VRC1	-1,3	-1,1	-1,0	-1,1	-1,0	-0,9	-0,6	-0,5	-0,6	-0,7	-0,6	-0,7	-0,7	-0,5	-0,4	-0,4
VRC2	-1,6	-1,4	-1,6	-1,4	-1,4	-1,3	-1,1	-1,0	-1,0	-1,1	-1,0	-1,0	-0,9	-0,5	-0,5	-0,5
VRC3	-2,0	-1,7	-1,8	-1,7	-1,6	-1,5	-1,1	-0,9	-0,9	-1,1	-0,9	-1,1	-1,0	-0,6	-0,5	-0,5
G-L	0,1	0,2	0,2	0,2	0,2	0,3	0,4	0,3	0,4	0,4	0,4	0,5	0,4	0,5	0,6	0,6
Brülhart B	0,1			-0,1												
	-0,2															

Source: own calculations

Examined at the three-digit disaggregated level, when RCA1 is taken into consideration, 5 out of 46 (11 %) sub-sectors (Dificult to imitate Research Intensive industry) reveals comparative advantage in 2008 (see Table 13). This number has increased from 1 in 1993 to 5 in 2008. According to RCA3, VRC1 and VRC3 indices, the number of sectors revealing competitive advantages has slightly increased.

Table 13: Difficult to Imitate Research Intensive Goods: Disaggregated Findings for Turkey to the EU – at the three digit level

	RCA1 (CEP)-VRC2		RCA2-GL		RCA3-RCA4		VRC1-VRC3	
	End	%	End	%	End	%	End	%
1993	1	2,2	0	0,0	2	4,3	3	6,5
1994	2	4,3	2	4,3	2	4,3	3	6,5
1995	2	4,3	3	6,5	4	8,7	3	6,5
1996	3	6,5	1	2,2	3	6,5	2	4,3
1997	3	6,5	1	2,2	2	4,3	2	4,3
1998	2	4,3	1	2,2	2	4,3	2	4,3
1999	2	4,3	3	6,5	3	6,5	3	6,5
2000	2	4,3	1	2,2	3	6,5	5	10,9
2001	3	6,5	3	6,5	3	6,5	5	10,9
2002	3	6,5	2	4,3	4	8,7	4	8,7
2003	5	10,9	5	10,9	5	10,9	5	10,9
2004	5	10,9	3	6,5	3	6,5	4	8,7
2005	5	10,9	2	4,3	2	4,3	3	6,5
2006	5	10,9	4	8,7	3	6,5	5	10,9
2007	5	10,9	4	8,7	4	8,7	7	15,2
2008	5	10,9	4	8,7	4	8,7	6	13,0

Source: own calculations

V. Consistency of the Trade Measures

Consistency of the results of various trade measures is one of the main areas of dispute in the field. The easiest way to compare the results of measure of competitiveness with different methods is to examine the summary statistics concerned. However this type of investigation is doubtful. Thus it is the consistency of the results that matter if different indices are calculated. There are some different consistency tests in the literature, namely;[11]

- *Spearman Rank Correlation Coefficient*
- *Kruskal-Wallis test.*
- *Dichotomous consistency test.*

RCA indices try to measure the comparative (dis)advantage of an industry in the country by cardinal approach. According to Ballance et al (1987), there are two other interpretations in addition to cardinal type of interpretation, namely ordinal and dichotomous interpretations. These three type of interpretations need consistency tests (Ballance, et al, 1987; Fertö and Hubbard, 2003).

Consistency test of cardinal measurement of comparative advantage is based on the correlation between index pairs in each year. According to the results of this test that depends on the correlation between index pairs in each of sixteen years for RCA1, RCA2, RCA3 and VRC1, high correlation ($\geq$0,75) has been attained only between four pairs. This shows that indices do not reveal consistent results for cardinal interpretation of comparative advantage.

The consistency test of ordinal measurement of comparative advantage depends on Spearman rank correlation coefficient for each pair. Table 14 reports the Spearman Rank Correlation Coefficients for full period averages of competition levels and sub-periods 1993-1995 and 1996-2008. Reported coefficients points out those relevant trade measures of competitiveness are not consistent[12]. In summary, the Spearman rank correlation coefficients are not consistent between different methods. Method selection and its impacts must be taken into consideration when the rankings of the decision makers are important.

[11] "Spearman's rank correlation coefficient test" tests between the methods of the results of the activities of the industry rankings in terms of consistency while "Kruskal-Wallis test", regardless of their distribution, tests whether competition results have different averages or not.

[12] Correlation coefficients are not shown for each year. Calculations that produced from the means are shown just as examples.

Table 14: Different Methods and the Consistency test of competitiveness measures: Spearman Rank Correlation Coefficient

Correlation Coefficients				
1993-1995		*RCA1*	*RCA3*	*VRC1*
	RCA1	1		
	RCA3	0,78**	1	
	VRC1	0,60**	0,74**	1
1996-2008	RCA1	1		
	RCA3	0,70**	1	
	VRC1	0,55**	0,65**	1
1993-2008	RCA1	1		
	RCA3	0,70**	1	
	VRC1	0,55**	0,67**	1

** states % 1 significance level
Source: own calculations

Another method to test the consistency of the trade measures of competitiveness is the Kruskal-Wallis test. The Kruskal-Wallis test allows for testing the consistency of three different indices at the same time. Results are reported in Table 15.

Table 15: The Kruskal-Wallis (RCA1, RCA3, VRC1) Consistency Test

	1993-1995	1996-2008	1993-2008
Ho: All indices of comp. are the same.	125,01**	146,18**	147,13**
critical value (%5, df=2)	5,99	5,99	5,99

** states that the two indicators of competitiveness is different statistically at % 1 significance level
Source: own calculations

Empirical test results given in Table 15 provide evidence in favour of the inconsistency of the indices. That is, Ho is rejected.

Dichotomous (binary) test of consistency depends on the comparison of one pair of index to see the share of the industries whether having comparative advantage or disadvantage. Table 16 reveals some results suggesting evidence that there are coincidences at 80-90 per cent level in terms of sharing the industries as to comparative advantage or comparative disadvantage.

Table 16: Dichotomous (binary) test of consistency: The share of coincident indices (%)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
RCA1-VRC2																
RCA2	84	83	82	83	81	83	82	81	81	81	78	78	78	79	81	79
RCA3-4	84	83	83	87	85	86	83	84	83	81	79	81	80	81	82	79
VRC1-3	86	85	83	84	83	83	79	79	79	77	77	83	81	82	80	81
RCA2																
RCA3-4	96	98	96	94	94	95	96	93	99	98	98	97	98	94	96	97
VRC1-3	87	88	87	86	85	87	88	86	88	89	90	89	90	83	86	88
RCA3-4																
VRC1-3	89	89	88	87	85	89	89	91	87	89	90	90	90	81	89	88

Source: own calculations

All these results are confirmative in the direction of sensitivity of the choice of the trade measure index. That is, results vary according to the index used. For this reason, this should be taken into account and common points of the results for different indices should be observed. Our results here are also consistent with the literature underlining the importance of the sensitivity of the results[13]. Especially verifying the findings of Ballance *et al* (1987), this paper finds that the indices are neither suitable for cardinal nor ordinal measurements since the results are not consistent. Instead, only if results of the indices are used to measure the binary comparative advantages, then they are consistent to a greater extent. In conclusion, RCA measurements employed at this work turn out to be useful to see the comparative advantage on the specific industry of Turkey in the EU market although they prove to be less useful to explore the level and the order of this comparative advantage or disadvantage.

[13] Also Seymen and Şimşek (2006) found similar results.

VI. Conclusion

In the study to analyse the competitiveness of Turkey in the EU market different indices calculated based on inter-industry and intra-industry trade measures for the period 1993 to 2008. Since the alternative RCA indices explain revealed comparative advantage and competitiveness in different aspects (even original and revised Balassa indices), in stead of focusing on one index, alternative RCA/RC indices have been measured and compared. Those RCA/RC indices show only the tendency of the competitiveness of the country, it gives whether a country has a comparative/competitive advantage or not, so results need cautious interpretation. To see that if any change in Turkey's competitiveness structure with respect to the EU in the period in question, Brülhart-B index also measured in addition to other intra-industy trade measurement. Trade entropy index also measured to see trade integration level of Turkey to the EU. There is need to emphasise that also this index have constraint and reflects only country's concentrations in the market in to some degree, and geographical distance and the number of countries (in the EU market in our study) should be taken in to consideration.

It is also important that RCA calculations are based on observed trade data. Thus, there are possible influences of government interventions in the markets such as tariffs, quotas or subsidies. Although we have not measured the effect of government interventions on the RCA indices, we can still confirm that distortions are at reasonably minimal levels. Due to the implementation of the CU especially, there exists no tariffs and quotas on industrial commodities between Turkey and the EU. Furthermore, Turkey has preferential trade agreement with the EU on agricultural products.

In the study, the consistency of alternative measures of RCA has been called into question. This paper finds that the indices are neither suitable for cardinal nor ordinal measurements since the results are not consistent. Instead, only if results of the indices are used to measure the binary comparative advantages, then they are consistent to a greater extent. In conclusion, RCA measurements employed at this work turn out to be useful to see the comparative advantage on the specific industry of Turkey in the EU market although they prove to be less useful to explore the level of this comparative advantage or disadvantage.

The results in the classification based on technological nature of the sectors show that in aggregate level, Turkey have comparative/competitive advantage in raw materials and labour intensive goods. For the capital intensive goods, in aggregate level findings of original Balassa index seem to be different from the other RCA indices. In according to the results Turkey has relative export advantage in capital goods. On the other hand, other indices which include import performance show that this classification has revealed comparative disadvantage. In aggregate level, Turkey has comparative disadvantage in the research intensive (both easy and difficult to imitate) goods. To eliminate the aggregation problem, we also analyse sectors in 3 digit level by observation. This observation gave the

chance of capturing the sectors which has RCA in all indices and the sectors which shows substantial improvement in the period.

REFERENCES

Anderson, D. R., Sweeney, D. J., and Williams, T. E. (2002), *Statistics for Business and Economics*, South-Western College Publishing/Thomson Learning,

Balance, R.H., H. Forester and T. Murray (1987), "Consistency Tests of Alternative Measures of Comparative Advantage", *Review of Economics and Statistics*, 69, 157-61.

Balassa, B. (1965), "Trade Liberalisation and 'Revealed' Comparative Advantage", *The Manchester School*, 33, 99-123.

Balassa, B. (1977), "'Revealed' Comparative Advantage Revisited", *The Manchester School*, 45, 327-44.

Balassa, B. (1989), *Comparative Advantage, Trade Policy and Economic Development*, Harvester Wheatsheaf, New York.

Brülhart, M. (1994), "Marginal Intra-Industry Trade: Measurement and Relevance for the Pattern of Industrial Adjustment", *Weltwirtschaftliches Archiv*, 130(3), 600-613.

Erlat, G. and H. Erlat (2005), "Do Turkish Exports Have Comparative Advantage with Respect to the European Union Market, 1990-2000", *Proceedings of the Middle East Economic Association*, 7, http://www.sba.luc.edu/orgs/meea/volume7/erlat.pdf (11.11.2005).

EUECOPOL (2006), *European Economic Policy, European Integration and EU Enlargement with Special Reference to the Issue of Turkish Membership*, Conference held in May 2006, Brussels, http://euecopol.fh-brandenburg.de/ (17.07.2007).

Fertö, I. and L.J. Hubbard (2003), "Revealed Comparative Advantage and Competitiveness in Hungarian Agri-Food Sectors", *The World Economy*, 26(2), 247-59.

Finger, J. M. (1975), "Trade Overlap and Intra-Industry Trade", *Economic Inquiry*, 13, 581-589.

Finger, J. M. and D. A. DeRosa (1979), "Trade Overlap, Comparative Advantage and Protection", In *On the Economics of Intra-Industry Trade*, Ed. Herbert Giersch, Institut für Weltwirtschaft an der Universtat Kiel, Tübingen, 213-40.

Greenaway, D. and C. Milner (1986), *The Economics of Intra-Industry Trade*, Basil Blackwell Ltd., UK, Basil Blackwell Inc., USA.

Greenaway, D. and C. Milner (1993), *Trade and Industrial Policy in Developing Countries: A Manual of Policy Analysis*, The Macmillan Press, esp. Part IV Evaluating Comparative Advantage, 181-208.

Grubel, H. G. and P. J. Lloyd (1975), *Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products*, John Willey, New York.

Hinloopen, J. and C. Van Marrewijk (2001), "On the Empirical Distribution of the Balassa Index", *Weltwirtschaftliches Archiv,* 137, 1-35.

Hoekman, B. and S. Djankov (1997), "Determinants of the Export Structure of Countries in Central and Eastern Europe", *World Bank Economic Review*, 11, 471-87.

Hufbauer, C.G. and J. C. Chilas (1974), "Specialization by Industrial Countries: Extent and Consequences", in *The International Division of Labour: Problems and Perspectives, International Symposium*, Ed. H. Giersch, J.C.B. Mohr, Tubingen, 3-38.

Laaser, C. F. and K. Schrader (2002), "European Integration and Changing Trade Patterns: The Case of the Baltic Statets", *Kiel Working Paper,* No.1088, January.

Liesner, H.H. (1958), "The European Common Market and British Industry", *Economic Journal*, 68, 302-16.

Marwah, K. and L. R. Klein (1995), "The Possibility of Nesting South Asia in Asia-Pacific Economic Integration", *Journal of Asian Economics*, 6(1), 1-27.

OECD (2005), *International Trade by Commodity Statistics, SITC Revision 3*, CD-ROM Database.

Seymen, D. and N. Şimşek (2006), "Competitiveness Comperison of Turkey and Chine in the OECD Market", *Economics, Business, Finance*, No.244, 38-51 (Turkish).

Sheskin, D., (1997), *Handbook of Parametric and Nonparametric Statistical Procedures*, CRC Press, LLC, United States.

SPO, State Planning Organization, Several Year Statistics.

TUKSTAT, Turkish Statistics Institute, Several Year Statistics.

Utkulu U. and D. Seymen (2003), "Trade and Competitiveness between Turkey and the EU: Time Series Evidence", Europe in Global World-blending differences, *OPEN MINDS Conference*, University of Lodz, Lodz-Poland, September.

Utkulu, U., D. Seymen and A. Arı (2004), "Export Supply and Trade Reform: The Turkish Evidence", paper presented at *the International Conference on Policy Modelling*, Paris June 30-July 2, 2004.

Vollrath, T.L. (1991), "A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage", *Weltwirtschaftliches Archiv*, 130, 265-79.

Yeats, A.J. (1985), "On the Appropriate Interpretation of the Revealed Comparative Advantage Index: Implications of a Methodology Based on Industry Sector Analysis", *Weltwirtschaftliches Archiv,* 121(1), 61-73.

Yılmaz, B. (2003), "Turkey's Competitiveness in the European Union: A Comparison with Five Candidate Countries – Bulgaria, The Czech Republic, Hungary, Poland, Romania – and the EU15", *Ezoneplus Working Paper*, No.12, February.

Yılmaz, B. and S.J. Ergun (2003), "The Foreign Trade Pattern and Foreign Trade Specialisation of Candidates of the European Union", *Ezoneplus Working Paper*, No.19, September.

Appendix A

Raw Material Intensive Goods

SITC 0 Food and Live Animals

SITC 2 Crude Material, Inedible, Except Fuels (excluding 26)

SITC 3 Mineral Fuels, Lubricants and Related Materials (excluding 35)

SITC 4 Animal and Vegetable Oils, Fats and Waxes

SITC 56 Fertilizers (Other Than Those of Group 272)

Labour-Intensive Goods

SITC 26 Textile Fibres (Other Than Wool Tops and Other Combed Wool) and Their Wastes (Not Manufactured Into Yarn or Fabric)

SITC 6 Manufactured Goods Classified Chiefly by Material (excluding 62, 67, 68)

SITC 8 Miscellaneous Manufactured Articles (excluding 88, 87)

Capital-Intensive Goods

SITC 1 Beverages and Tobacco

SITC 35 Electric Current

SITC 53 Dyeing, Tanning and Colouring Materials

SITC 55 Essential Oils and Resinoids and Perfume Materials; Toilet, Polishing and Cleansing Preparations

SITC 62 Rubber Manufactures, n.e.s.

SITC 67 Iron and Steel

SITC 68 Non-Ferrous Metals

SITC 78 Road Vehicles (Including Air-Cushion Vehicles)

Easy-to-Imitate Research-Intensive Goods

SITC 51 Organic Chemicals

SITC 52 Inorganic Chemicals

SITC 54 Medicinal and Pharmaceutical Products

SITC 58 Plastics in Non-Primary Forms

SITC 59 Chemical Materials and Products, n.e.s.

SITC 75 Office Machines and Automatic Data-Processing Machines

SITC 76 Telecommunications and Sound-Recording and Reproducing Apparatus and Equipment

Difficult-to-Imitate Research-Intensive Goods

SITC 57 Plastics in Primary Forms

SITC 7 Machinery and Transport Equipment (excluding 75, 76, 78)

SITC 87 Professional, Scientific and Controlling Instruments and Apparatus, n.e.s.

SITC 88 Photographic Apparatus, Equipment and Supplies and Optical Goods, n.e.s.; Watches and Clocks

Appendix B

I. Raw Materials Intensive Goods

Full period three-digit level sectors revealing RCA/RC when all indices examined

046 Meal and flour of wheat and flour of meslin

048 Cereal preparations, flour of fruits or vegetables

054 Vegetables; roots & other edible vegetable products

056 Vegetables, roots, tubers, prepared, preserved n.e.s.

057 Fruits and nuts (excluding oil nuts), fresh or dried

058 Fruit, preserved, and fruit preparations (no juice)

059 Fruit and vegetable juices, unfermented, no spirit

062 Sugar confectionery

075 Spices

223 Oil seeds & oleaginous fruits (incl. flour, n.e.s.)

273 Stone, sand and gravel

278 Other crude minerals

283 Copper ores and concentrates; copper mattes, cement

287 Ores and concentrates of base metals, n.e.s.

291 Crude animal materials, n.e.s.

Sectors changing from RCD to RCA during the period (1993-2008)

011 Meat of bovine animals, fresh, chilled or frozen

016 Meat, edible meat offal, salted, dried; flours, meals

017 Meat, edible meat offal, prepared, preserved, n.e.s.

035 Fish, dried, salted or in brine; smoked fish

047 Other cereal meals and flour

061 Sugar, molasses and honey

072 Cocoa

091 Margarine and shortening

231 Natural rubber & similar gums, in primary forms

277 Natural abrasives, n.e.s. (incl. industry. diamonds)

284 Nickel ores & concentrates; nickel mattes, etc.

342 Liquefied propane and butane

Sectors changing from RCA to RCD during the period (1993-2008)

001 Live animals other than animals of division 03 (1998 onwards)

034 Fish, fresh (live or dead), chilled or frozen (2006 onwards)

036 Crustaceans, molluscs and aquatic invertebrates (2006 onwards)

037 Fish, aqua. Invertebrates, prepared, preserved, n.e.s. (2006 onwards)

043 Barley, unmilled

074 Tea and mate (1998onwards)

222 Oil seeds and oleaginous fruits (excluding flour) (2006 onwards)

246 Wood in chips or particles and wood waste

248 Wood simply worked, and railway sleepers of wood

292 Crude vegetable materials, n.e.s.

334 Petroleum oils or bituminous minerals > 70 % oil

422 Fixed vegetable fats & oils, crude, refined, fract.

Sectors revealing RCA/RC but losing competitive power in time according to Brülhart-B index (import-oriented change in time)

036 Crustaceans, molluscs and aquatic invertebrates

037 Fish, aqua. Invertebrates, prepared, preserved n.e.s.

054 Vegetables; roots & other edible vegetable products

059 Fruit and vegetable juices, unfermented, no spirit

278 Other crude minerals

291 Crude animal materials, n.e.s.

II. Labour Intensive Goods

Full period three-digit level sectors revealing RCA/RC when all indices examined

652 Cotton fabrics, woven

653 Fabrics, woven, of man0made fabrics

655 Knitted or crocheted fabrics, n.e.s.

658 Made0up articles, of textile materials, n.e.s.

661 Lime, cement, fabrica. constr. mat. (excluding glass, clay)

664 Glass

693 Wire products (excluding electrical) and fencing grills

697 Household equipment of base metal, n.e.s.

841 Men's clothing of textile fabrics, not knitted

843 Men's or boy's clothing, of textile, knitted, croche.

844 Women's clothing, of textile, knitted or crocheted

845 Articles of apparel, of textile fabrics, n.e.s.

846 Clothing accessories, of textile fabrics

848 Articles of apparel, clothing access. excluding textile

Sectors changing from RCD to RCA during the period (1993-2008)

642 Paper & paperboard, cut to shape or size, articles
654 Other textile fabrics, woven
657 Special yarn, special textile fabrics & related
663 Mineral manufactures, n.e.s.
666 Pottery
667 Pearls, precious & semi0precious stones
691 Structures & parts, n.e.s., of iron, steel, aluminium
694 Nails, screws, nuts, bolts, rivets & the like, of metal
695 Tools for use in the hand or in machine
811 Prefabricated buildings
821 Furniture & parts; bedding & similar stuffed furni
851 Footwear

Sectors changing from RCA to RCD during the period (1993-2008)

261 Silk
263 Cotton
269 Worn clothing and other worn textile articles; rags
612 Manufactures of leather, n.e.s.; saddlery & harness
651 Textile yarn (2006 onwards)
656 Tulles, trimmings, lace, ribbons & other small wares (2006 onwards)
659 Floor coverings, etc. (2006 onwards)
665 Glassware (2006 onwards)
692 Metal containers for storage or transport (2006 onwards)
696 Cutlery
842 Women's clothing, of textile fabrics (2006 onwards)
897 Jewellery & articles of precious material. n.e.s.

Sectors revealing RCA/RC but losing competitive power in time according to Brülhart-B index (import-oriented change in time)

651 Textile yarn

652 Cotton fabrics, woven

848 Articles of apparel, clothing access. excluding textile

III. Capital-Intensive Goods

Full period three-digit level sectors revealing RCA/RC when all indices examined

121 Ttobacco, unmanufactured; tobacco refuse

672 Ingots, primary forms, of iron or steel; semi-finis.

676 Iron & steel bars, rods, angles, shapes & sections

Sectors changing from RCD to RCA during the period (1993-2008)

531 Synth. organic colouring matter & colouring lakes

532 Dyeing & tanning extracts, synth. tanning materials

673 Flat0rolled prod., iron, non0alloy steel, not coated

674 Flat0rolled prod., iron, non0alloy steel, coated, clad

681 Silver, platinum, other metals of the platinum group

683 Nickel (2007 onwards)

684 Aluminium

786 Trailers & semi trailers; transport containers

Sectors changing from RCA to RCD during the period (1993-2008)

111 Non-alcoholic beverages, n.e.s. (1997 onwards – RCA1)

122 Tobacco, manufactured (2004 onwards – RCA1 and RCA3)

625 Rubber tyres, tyre treads or flaps & inner tubes (2006 onwards)

682 Copper

782 Motor vehicle. for transport of goods, special purpose. (2006 onwards)

785 Motorcycles & cycles; invalid carriages (2005 onwards – VRC)

Sectors revealing RCA/RC but losing competitive power in time according to Brülhart-B index (import-oriented change in time)

121 Ttobacco, unmanufactured; tobacco refuse

672 Ingots, primary forms, of iron or steel; semi-finis.

673 Flat0rolled prod., iron, non0alloy steel, not coated

IV. Easy-to-Imitate Research-Intensive Goods

Full period three-digit level sectors revealing RCA/RC when all indices examined

NONE!

Sectors changing from RCD to RCA during the period (1993-2008)

513 Carboxylic acids, anhydrides, halides, per.; derivati.

514 Nitrogen function compounds

581 Tubes, pipes and hoses of plastics (2002 onwards – RCA1, VRC1 and VRC3)

582 Plates, sheets, films, foil & strip, of plastics (RCA1 and VRC2)

583 Monofilaments, of plastics, cross0section > 1mm (2003 onwards - RCA1 and RCA3)

597 Prepared addit. for miner. oils; lubricant., deicing

751 Office machines

Sectors changing from RCA to RCD during the period (1993-2008)

511 Hydrocarbons, n.e.s., & halogenated, nitr. Derivative (RCA1,VRC1)

523 Metallic salts & peroxysalts, of inorganic acids (2001 onwards - all indices)

761 Television receivers, whether or not combined

763 Sound recorders or reproducers; television record.

Sectors revealing RCA/RC but losing competitive power in time according to Brülhart-B index (import-oriented change in time)

NONE!

V.Difficult-to-Imitate Research-Intensive Goods

Full period three-digit level sectors revealing RCA/RC when all indices examined

775 Household type equipment, electrical or not, n.e.s.

Sectors changing from RCD to RCA during the period (1993-2008)

722 Tractors (excluding those of 71414 & 74415) (2003 onwards – RCA1)

733 Mach.0tools for working metal, excluding removing mate. (2003 onwards – RCA1)

746 Ball or roller bearings (RCA1)

763 Sound recorders or reproducers; television record. (2003onwards – RCA3, VRC1 and VRC3)

778 Electrical machinery & apparatus, n.e.s.

792 Aircraft & associated equipment; spacecraft, etc. (1999onwards – RCA3)

873 Meters & counters, n.e.s.

884 Optical goods, n.e.s.

Sectors changing from RCA to RCD in the during the period (1993-2008)

771 Electric power machinery, and parts thereof (1998 onwards – RCA, and VRC1 and VRC2 for 2005)

773 Equipment for distributing electricity, n.e.s. (2006 onwards)

793 Ships, boats & floating structures (2006 onwards – RCA1, RCA3, VRC1 and VRC3)

Sectors revealing RCA/RC but losing competitive power in time according to Brülhart-B index (import-oriented change in time)

NONE!