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COMPARATIVE ADVANTAGE AND THE PRODUCT MAPPING OF EXPORTING SECTORS IN TURKEY

Abstract

The purpose of this paper is to analyze the competitiveness of the five sectors which have the largest share in Turkey's export for the period 2000-2014 in global markets. Balassa's Revealed Comparative Advantages (RCA) index and Vollrath's competitiveness indices are used to identify whether or not Turkey has a comparative advantage in these sectors. We also use the Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI) to determine the competitiveness of the five largest sectors in Turkey. Furhermore we create the product mapping of the sectors which are analyzed in the study.

According to index results the textile and clothing industries are the strongest sectors in the Turkish economy. Turkey has a comparative advantage and is net-exporter in these sectors during the period. In other words Turkey has export specialization in these products. Consequently, the findings strongly support the theory of comparative advantage.

Key words: Revealed Comparative Advantage, Revealed Symmetric Comparative Advantage, Trade Balance and Product Mapping.

TÜRKİYE'DE İHRACATCI SEKTÖRLERİN KARŞILAŞTIRMALI ÜSTÜNLÜĞÜ VE ÜRETİM HARİTASI

Özet

Bu makalenin amacı, global piyasalarda 2000-2014 dönemi için Türkiye'nin ihracatında en büyük paya sahip olan beş sektörün rekabet gücünü analiz etmektir. Türkiye'nin bu sektörlerde rekebet gücü olup olmadığını belirlemek için, Balassa'nın Açıklanmış Karşılaştırmalı Üstünlük İndeksi, Vollrath'ın Rekabet

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Gücü İndeksleri, Açıklanmış Simetrik Karşılaştırmalı Üstünlük İndeksi ve Ticaret Dengesi İndeksi kullanılmaktadır. Ayrıca çalışmada analiz edilen sektörlerin üretim haritası oluşturulmuştur.

İndeks sonuçlarına göre, tekstil ve giyim endüstrileri Türkiye ekonomisindeki en güçlü sektörlerdir. Ülke söz konusu dönem için bu sektörlerde karşılaştırmalı üstünlüğe sahiptir ve net ihracatçı konumdadır. Başka bir ifadeyle bu ürünlerde ihracatta uzmanlaşmaya sahiptir. Sonuç olarak bulgular karşılaştırmalı üstünlük teorisini destekler niteliktedir.

Anahtar Kelimeler: Açıklanmış Karşılaştırmalı Üstünlük, Açıklanmış Simetrik Karşılaştırmalı Üstünlük, Ticaret Dengesi ve Üretim Haritası.

INTRODUCTION

The Revealed Comparative Advantage is an index used in international economics for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. It is based on the Ricardian comparative advantage concept.

In the theories of international trade, comparative advantage is an important concept for explaining the pattern of trade David Ricardo (1817) first introduced the concept of comparative advantage. According to David Ricardo's theory, some individuals or countries are relatively more productive in some activities than other countries. A comparative advantage gives a company the ability to sell goods and services at a lower price than its competitors and realize stronger sales margins. According to Ricardo a nation, like a person, gains from trade by exporting the goods or services in which it has the greatest comparative advantage in productivity and importing those in which it has the least comparative advantage.

Ricardo's theory is based on some strict assumptions but in the modern theories of international trade these strict assumptions are replaced with more realistic ones. Heckscher (1919) and Ohlin (1933) examine the effect of different factor endowments on international trade. Their model, which is well known as the Heckscher-Ohlin (HO) model, concludes that a country will export a commodity which uses the abundant factor of production, while it will import a commodity which uses the scarce factor of production (Tri Widodo 2009, 57-58).

The most important sectors are the textile, clothing, iron and steel, electrical machines and motor vehicle industries in terms of production, employment and export in the Turkish economy. The purpose of this study, is to show if Turkey has a revealed comparative advantage in these sectors, which have an important place in export for the period 2000-2014, by using the Balassa, Vollrath, RSCA and TBI indices. The literature on this subject is available in many studies for measuring the revealed comparative advantage of a country. The Balassa and Vollrath indices are generally used in these studies. However, in recent studies the RSCA and TBI index are used. This study is important in terms of the competitiveness measurement of a country with RSCA and TBI indices and determining the location in the production map of the products analyzed in the study using these index values.

The paper consists of 4 sections. Section 1 presents the emprical literature related with the measurement competitiveness of the country. Section 2 provides various approaches to measure the revealed comparative advantage theoreticaly. Section 3 presents the emprical results. In this

section we examine the empirical results as Balassa and Vollrath index results and RSCI and TBI index results. Finally, several conclusions are presented in Section 4.

1. Empirical Literatüre

Bela Balassa and Marcus Noland (1989), examined the changes in the comparative advantage of Japon and the United States for 57 primary and 167 manufactured products during the period 1967-1983. The results of the study showed increased specialization in Japon's human-capital intensive products, at the expense of unskilled-labor intensive and natural resource products between 1967 to 1983. The United States became increasingly specialized in natural resource intensive products. Both countries increased their comparative advantage in high technology products.

Levent Kösekahyaoğlu (2003) analyzed the comparative advantage of Turkey with regard to the EU at sectoral level by using Balassa's RCA index for both pre-and-post liberalization periods. According to the study results, Turkey had become lower competitiveness in some of its traditional labor intensive industries after the implementation of the liberalization program in the 1980s. The reason for this was the increased wages in these traditional labor intensive industries due to an increase in labor demand.

Marc-Andreas Muendler (2007) measured the construction of the comparative advantage for the Brazilian agriculture, mining and manufacturing sectors between 1986 and 2001. He used ISIC Rev. 2 classification. According to Balassa (1965) measure of comparative advantage, Brazil's comparative advantage pattern was relatively stable over the period 1986-2001. For Brazil, this was not statistically significantly related to tariffs. Year indicators are neither individually nor jointly different from zero at common significance levels.

Vildan Serin and Abdulkadir Civan (2008) sought to determine whether or not Turkey had a comparative advantage in the tomato, olive oil, and fruit juice industries in the period 1995-2005 in the EU market. They used the RCA and the Comparative Export Performance (CEP) index to measure Turkey's competitiveness in these sectors. In addition, the import demand functions of the EU were estimated for rival countries. Using regression analysis they hypothesized that if Turkey is a competitor for these countries, its price will have a statistically significant effect on export demand functions. Both the index and regression results indicated that Turkey had a strikingly high comparative advantage in the fruit juice and olive oil markets in the EU but this was not the case in the tomato market.

Muhammad ShairatUllah and Inaba Kazuo (2012) analyzed the comparative advantage of the Bangladeshi economy in 97 products at the three-digit levels of the Standard International Trade Classifications (SITC) for Bangladesh from 1990 to 2007. The analytical tools included the Normalized Revealed Comparative Advantage (NRCA) index and products mapping. The empirical results showed that Bangladesh possessed a comparative advantage in some primary and labor intensive manufacturing products; the competitiveness of primary products had declined while labor intensive products had become more competitive; and there are some potential products that require policy support to strengthening competitiveness.

Betül Altay Topcu and Emine Kılavuz (2012) analyzed the competitive performance of the Turkish manufacturing sector after the Custom Union Agreement with the EU (the period 1996 to 2006). They also determined whether or not the pattern of comparative advantage for Turkey had underwent a structural shift over the period 1996-2006. Balassa's RCA index and

Vollrath's competitiveness indices were used to identify whether or not Turkey has a comparative advantage in any particular product group. In the calculating of these indices, the manufacturing industry is divided into four groups according to the intensity of technology using International Standard Industrial Classification (ISIC) Rev.2 as follows: high-tech industries, medium-to-high-tech industries, medium-to-low-tech industries and low-tech industries.

The calculated indices were not consistent with the hypothesis that the Custom Union causes important changes in the competitiveness of the Turkish manufacturing sector. The empirical findings suggested that Turkey had a comparative advantage in the trade of some low-tech and medium-low-tech industries. In other words, Turkey had mostly a comparative advantage in labor-intensive and raw material-intensive goods. The trend of export patterns in Turkey after the CU agreement has not shifted towards high-tech manufacturing sectors with a comparative advantage.

Jens Oelgemöller (2012) measured the international competitiveness of four European countries which are Portugal, Ireland, Greece and Spain, the so called PIGS countries, using the RCA index developed by Balassa. He also measured the comparative advantage of PIGS countries with another index which is used by the German Council of Experts. According to the results of these indices Portugal and Greece have dominant advantages in agriculture and natural resources. Ireland stands out from the other PIGS countries, as high-tech and medical/chemical products occur in the top sectors. Spain's top export sectors do not have the competitiveness that one might expect.

Oelgemöller (2012) also used the RSCA and TBI indices to determine the competitiveness of these countries. This showed that Ireland's industry is to a certain extent dependent on the world market. Export growth will not have a major impact in Greece and Portugal. Spain does have competitive sectors and a degree of specialization, but in fact the most important export sectors are less competitive.

Ana Shohibul MA (2013) investigated the comparative advantage of ASEAN countries and China. He tested the comparative advantage by using the RSCA and TBI indices. Export products were analyzed based on SITC Rev. 3, which is divided into primary products and manufactured products. The Chinese have more established patterns of trade, while ASEAN trade patterns are very dynamic. The study results support to the theory of comparative advantage.

Grazina Startiene and Rita Remeikiene (2014) measured the competitiveness of Lithuanian industrial products in the global markets using the RCA index and RSCA index the period of 2007-2011. While they interpreted the Balassa index results, they used the Balassa index classification presented by Hinloopen and Marrewijk (2000). They obtained similar results in the evaluation of the competitiveness of Lithuanian industry in global markets by the RCA and RSCA indices. The values of both indexes showed that the strongest competitive positions in the global markets during the period of 2007-2011 were held by Lithuanian food, chemicals, wood and textile manufactures.

Nguyen K. Doanh investigated the dynamics of Korea's export specialization. Using various analytical tools, their empirical findings were established as follows. *First*, Korea follows the Heckscher-Ohlin model. In other words, the patterns of Korea's comparative

advantage have become more in keeping with its factor endowment. *Second*, the pattern of Korea's revealed comparative advantage has more or less diverged. The results show that there is a movement towards specialization. *Third*, while the RCA indices in class a are consistent, the corresponding figures for classes b, c and d exhibit a moderate variation in their pattern. *Fourth*, while unskilled labor intensive products show a relatively high degree of export specialization, other product categories exhibit a relatively high degree of export diversification. Overall, there is an upward trend in the degree of specialization for all commodity groups. *Finally*, Korea's exports are heavily dominated by technology and human capital intensive products.

However many applied economists, e.g. Hans H. Liesner (1958), Balassa (1965), J.B. Donges and James R.C (1977), Arye L. Hillman, A.L. (1980), Hary P. Bowen (1983), A.J. Yeats (1985), Vollrath (1991), Bent Dalum, Keld Laursen and Gert Villumsen (1998) and Keld Laursen (1998) and others have tried to make various empirical measures to "reveal" countries' comparative advantage.

2. Revealed Comparative Advantage Indices

There are many indices in the empirical literature related with measurement of competitiveness. The Balassa and Vollrath indices are used extensively in there. We will introduce Balassa, Vollrath, RSCA and TBI indices which are used in our empirical studies.

Bela Balassa (1965) derived an index that measures a country's revealed comparative advantage in the trade of a particular product/industry by calculating the share of that product/industry in the country's total exports relative to the product/industry's share in total world export. Thus, the aim is to identify whether a country has a revealed comparative advantage rather than to specify the underlying sources of the comparative advantage. Formally, the index can be presented as

$$\mathrm{RCA}_1 = \frac{\mathrm{X_{ij}}/\mathrm{X_{it}}}{\mathrm{X_{nj}}/\mathrm{X_{nt}}}$$

where X represents exports, i is a country, j is a commodity, t is a set of commodities, and n is a set of countries. In our case, i is Turkey, j is the sectors which have the largest share in Turkey's export, t is total exports and n is the world.

If the value of the index exceeds unity, the country is said to have a revealed comparative advantage. In other words, the industry's share in the country's total exports is greater than its share in the world trade. If the value is less than unity, the country is said to have a comparative disadvantage in the product/industry (Inka Havrıla and Pemasiri Gunawardana 2003, 108).

Jeroen Hinloopen and Charles V. Marrewijk (2001) commented on the Balassa index from a different perspective. In other words, the interpretation of Balassa index values was based on the classification of the RCA index values presented by them. These classifications are shown in Table 1.

Table 1. The Classification of RCA Index Values

Class A	0 < Balassa Index ≤ 1	Revealed Comparative Disadvantage
Class B	1 < Balassa Index ≤ 2	Weak Comparative Advantage
Class C	2 < Balassa Index ≤ 4	Medium Comparative Advantage
Class D	4 < Balassa Index	Strong Comparative Advantage

As shown in Table 1, Class A includes all the products or industries/sectors for which a country does not have a revealed comparative advantage; the other three classes (B, C, D) approximately divide the products or industries/sectors related to the revealed comparative advantage into three levels: weak comparative advantage-Class B, medium comparative advantage -Class C and strong comparative advantage-Class D.

Several indices are used to examine the competitiveness of a country. One of the most widely used of these is the Thomas L. Vollrath (1991) index which is based on the difference between the Revealed Export Advantage (RXA) and the Revealed Import Advantage (RMA), with notation as follows:

$$RCA_2 = \frac{X_{ij}/X_{it}}{X_{nj}/X_{nt}} - \frac{M_{ij}/M_{it}}{M_{nj}/M_{nt}}$$

where M represents imports. Vollrath's second measure is simply the logarithm of RXA (ln RXA) as follows:

$$RCA_3 = \ln\left(\frac{X_{ij}/X_{it}}{X_{nj}/X_{nt}}\right)$$

Vollrath's third measure is based on the difference between the logarithm of RXA (ln RXA) and the logarithm of RMA (ln RMA)and is given as follows:

$$RCA_4 = \ln\left(\frac{X_{ij}/X_{it}}{X_{nj}/X_{nt}}\right) - \ln\left(\frac{M_{ij}/M_{it}}{M_{nj}/M_{nt}}\right)$$

According to Vollrath (1991), positive indices revealed a comparative/competitive advantage, whereas negative values revealed a comparative/competitive disadvantage (Altay Topcu and Kılavuz 2012, 25-26).

Widodo (2009) constructed the "products mapping" tool to examine dynamic changes in the comparative advantage of the East Asian countries from the perspective of flying geese patterns of industrial competitiveness in the region. According to Widodo (2009), two indicators are required to represent both two points of view: domestic trade-balance and international competitivenes. He chose the RSCA by Dalum, Laursen and Villumsen (1998) as the indicator of comparative advantage and the TBI by Lafay (1992) as the indicator of export-import

activities. The RSCA index is a simple decreasing monotonic transformation of the RCA or Balassa index.

The RSCA index created by Dalum, Laursen and Villumsen (1998) is formulated as follows:

$$RSCA_{ij=}(RCA_{ij}-1)/(RCA_{ij}+1)$$

where RCA_{ij} represents the Balassa Index (RCA_1). The values of the RSCA index can vary from minus one to one (or -1≤RSCA≤1). An RSCA value greater than zero implies that country i has a comparative advantage in the group of products j. In contrast, an RSCA value less than zero implies that country i has a comparative disadvantage in the group of products j.

The Trade Balance Index (TBI) (Lafay 1992) is employed to analyze whether a country has specialization in export (as a net-exporter) or in import (as a net-importer) for a specific group of products. The TBI is simply formulated as follows:

$$TBI_{ij=}(X_{ij}-M_{ij})/(X_{ij}+M_{ij})$$

where TBI denotes the trade balance index of country i for the group of products j. The values of the index range from -1 to +1. In short, the TBI equals -1 if a country only imports; in contrast, the TBI equals +1 if a country only exports. Indeed, the index is not defined when a country neither exports nor imports. In this case, we put zero since the group of products shows either potential to be exported or imported. Any value between -1 and +1 implies that the country exports and imports a commodity simultaneously. A country is referred to as a "net-importer" in a specific group of products where the value of the TBI is negative, and as a "net-exporter" where the value of the TBI is positive.

In recent years after Widodo (2009), Oelgemöller (2012), ShairatUllah and Kazuo (2012) and, Ishchukova and Smutka (2013) also created a product mapping using these two indices values.

Table 2 represents a matrix for the distribution of the entire set of exported products mapping. According to Table 2, products can be categorized into four groups as A, B, C and D. Group A consists of products which have both comparative advantage and export-specialization; Group B consists of products which have comparative advantage but no export-specialization; Group C consists of products which have export-specialization but no comparative advantage; and Group D consists of products which have neither comparative advantage nor export-specialization.

Table 2. Product Mapping

RSCA	**RSCA > 0**	**Group B:** Comparative Advantage Net-importer (RSCA > 0 and TBI <0)	**Group A:** Comparative Advantage Net-exporter (RSCA > 0 and TBI >0)
	RSCA < 0	**Group D:** Comparative Disadvantage Net-importer (RSCA < 0 and TBI <0)	**Group C:** Comparative Disadvantage Net-exporter (RSCA < 0 and TBI >0)
		TBI < 0	**TBI > 0**
		TBI	

3. Empirical Results

3.1. Data

In order to determine the competitiveness of the sectors which have the largest share in Turkey's export in the world scale, we used the Balassa index (RCA_1), Vollrath indices (RCA_2, RCA_3, RCA_4) and the RSCA and TBI indices. We also created "product mapping"of the sectors benefiting from the RSCA and TBI index values. We measured the competitiveness of as found in SITC Rev. 3 the five sectors which have the largest share in Turkey's export for the period 2000-2014. These are two digits sectors and are the 78 (Road vehicles including air-cushion vehicles), 84 (Articles of apparel and clothing accessories), 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products), 67 (Iron and steel) and 77 (Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof) coded sectors. Export and import data were in US dollars and were retrieved from the United Nations Commodity Trade Statistics Database.

3.2. The Results of Balassa Index and Vollrath Indices

The Balassa index results are shown in Table 3. According to the Balassa index (RCA_1) results, Turkey had a comparative advantage in the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products), 67 (Iron and steel) and 84 (Articles of apparel and clothing accessories) coded sectors for the 2000-2014 period. According to the results of the RCA_1 index, the 84 (Articles of apparel and clothing accessories) coded sector had the highest index value for the period studied. The following sectors with the highest RCA values are the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products) and 67 (Iron and steel) coded sectors. On the other hand, while Turkey had a comparative disadvantage in the 77 (Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof) coded sector for 2000-2005 period, it had a comparative advantage for the 2006-2014 period. Turkey had a comparative advantage in the 78 (Road vehicles including air-cushion vehicles) coded sector after the 2000 period.

According to the classification of the RCA index (Balassa Index) values generated by Hinloopen and Marrewijk (2000), Turkey had a medium comparative advantage in the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products) coded sector for the 2000-2014 period. Turkey had weak comparative advantage in the 67 (Iron and steel) coded sector for the 2000-2014 period. It did not have a comparative advantage in the 77 (electrical machinery,

apparatus and appliances, n.e.s. and electrical parts thereof) coded sector for the 2000-2005 period, but it did have a weak comparative advantage for 2006 and later years in this sector. On the other hand, Turkey had a mostly weak comparative advantage in the 78 (Road vehicles including air-cushion vehicles) coded sector except for the 2000 year, for the 2001-2014 period. Turkey had a strong comparative advantage in the 84 (Articles of apparel and clothing accessories) coded sector for the 2000-2014 period but this advantage decreased significantly in the after years 2005.

Table 3. The Revealed Comparative Advantage of Turkey in World Scale

According to Balassa Index (RCA_1)

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	3,4065	1,5149	0,7759	0,5476	48,7983
2001	2,7121	1,8317	0,8795	1,6725	36,8423
2002	2,1431	1,8445	0,8288	1,9762	40,7726
2003	2,2441	1,4942	0,8670	1,3587	34,6035
2004	2,3825	1,7422	0,7802	1,2456	26,5556
2005	2,5323	1,3726	0,8504	1,4438	23,8704
2006	2,6412	1,4511	1,0698	1,7175	17,9157
2007	2,3593	1,3400	1,2580	2,0682	14,0528
2008	2,5470	1,7142	1,3487	2,2273	9,3823
2009	2,2577	1,6329	1,2643	1,8770	7,4224
2010	2,2313	1,7123	1,4187	1,6711	7,3263
2011	2,5446	1,9849	1,5380	1,6428	7,6101
2012	2,6616	1,8308	1,6029	1,6034	8,2772
2013	2,9664	1,5705	1,8054	1,6613	8,1273
2014	2,7021	1,4625	1,7047	1,7389	7,9344

Source: Authors' Calculations.

The Vollrath Indices (RCA_2, RCA_3 and RCA_4) results are shown in Table 4, 5 and 6.

Table 4. The Revealed Comparative Advantage of Turkey in World Scale

According to Vollrath Indices (RCA_2)

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	3,1130	0,8548	-0,5129	-1,2787	48,7778
2001	2,3433	1,2858	-0,2576	1,0746	36,8151
2002	1,6765	1,3024	-0,3778	1,4701	40,7481
2003	1,7985	0,8250	-0,2863	0,6227	34,5746
2004	1,9628	1,1683	-0,5014	0,4428	26,5180
2005	2,1375	0,6441	-0,3255	0,7512	23,8285
2006	2,2626	0,7620	0,1350	1,1352	17,8599
2007	1,9354	0,5937	0,4632	1,5847	13,9817
2008	2,1544	1,1309	0,6073	1,7784	9,2757
2009	1,8148	1,0205	0,4734	1,3443	7,2876
2010	1,7831	1,1283	0,7139	1,0726	7,1898
2011	2,1516	1,4812	0,8878	1,0341	7,4787
2012	2,2858	1,2846	0,9790	0,9797	8,1564
2013	2,6293	0,9337	1,2514	1,0594	8,0043
2014	2,3320	0,7788	1,1181	1,1639	7,8084

Source: Authors' Calculations

Table 5. The Revealed Comparative Advantage of Turkey in World Scale According to Vollrath Indices (RCA_3)

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	1,2257	0,4154	-0,2537	-0,6023	3,8877
2001	0,9977	0,6052	-0,1285	0,5143	3,6066
2002	0,7623	0,6122	-0,1878	0,6812	3,7080
2003	0,8083	0,4016	-0,1427	0,3065	3,5440
2004	0,8681	0,5552	-0,2481	0,2197	3,2792
2005	0,9291	0,3167	-0,1620	0,3673	3,1726
2006	0,9712	0,3723	0,0674	0,5409	2,8857
2007	0,8584	0,2927	0,2296	0,7267	2,6428
2008	0,9349	0,5390	0,2992	0,8008	2,2388
2009	0,8143	0,4904	0,2345	0,6297	2,0045
2010	0,8026	0,5378	0,3498	0,5135	1,9915
2011	0,9340	0,6856	0,4305	0,4964	2,0295
2012	0,9789	0,6048	0,4718	0,4721	2,1135
2013	1,0874	0,4514	0,5908	0,5076	2,0952
2014	0,9940	0,3802	0,5334	0,5533	2,0712

Source: Authors' Calculations.

Table 6. The Revealed Comparative Advantage of Turkey in World Scale According to Vollrath Indices (RCA_4)

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	2,4514	0,8307	-0,5075	-1,2045	7,7754
2001	1,9954	1,2105	-0,2569	1,0287	7,2133
2002	1,5246	1,2245	-0,3756	1,3623	7,4160
2003	1,6166	0,8032	-0,2853	0,6131	7,0879
2004	1,7363	1,1103	-0,4963	0,4393	6,5585
2005	1,8583	0,6335	-0,3241	0,7346	6,3453
2006	1,9425	0,7447	0,1349	1,0817	5,7714
2007	1,7167	0,5853	0,4591	1,4534	5,2856
2008	1,8698	1,0779	0,5983	1,6016	4,4777
2009	1,6287	0,9807	0,4691	1,2594	4,0090
2010	1,6051	1,0756	0,6996	1,0269	3,9829
2011	1,8679	1,3712	0,8610	0,9929	4,0590
2012	1,9578	1,2095	0,9436	0,9443	4,2270
2013	2,1747	0,9027	1,1815	1,0153	4,1905
2014	1,9881	0,7604	1,0668	1,1066	4,1424

Source: Authors' Calculations.

As shown in Table 4, 5 and 6, these indices show similar results with the Balassa index (RCA_1). The Vollrath indices' results are also consistent with each other. The calculated RCA indices for the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products), 67 (Iron and steel) and 84 (Articles of apparel and clothing accessories) coded sectors had positive values for the 2000-2014 period. In other words, Turkey had a comparative advantage in these

sectors in the study period. However, the 77 (Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof) coded sector for the 2000-2005 period and the 78 (Road vehicles including air-cushion vehicles) coded sector for the year 2000 had negative values. In other words, Turkey had a comparative disadvantage in these sectors in the said period.

3.3. The Results of RSCA and TBI Indices and the Product Mapping of Sectors

The RSCA index results are shown in Table 7. This index has similar results with the Balassa index and Vollrath indices. The values of the RSCA index are greater than zero in the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products), 67 (Iron and steel) and 84 (Articles of apparel and clothing accessories) coded sectors from 2000 to 2014. In other words, Turkey had a comparative advantage in the said sectors and period. The fact that values of the RSCA index are less than zero implies that Turkey had a comparative disadvantage in the 77 (Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof) coded sector from 2000 to 2005, and in the 78 (Road vehicles including air-cushion vehicles) coded sector for 2000.

Table 7. The Revealed Comparative Advantage of Turkey in World Scale According to RSCA Index

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	0,5461	0,2047	-0,1262	-0,2923	0,9598
2001	0,4612	0,2937	-0,0641	0,2516	0,9471
2002	0,3637	0,2969	-0,0936	0,3280	0,9521
2003	0,3835	0,1981	-0,0712	0,1521	0,9438
2004	0,4087	0,2707	-0,1234	0,1094	0,9274
2005	0,4338	0,1571	-0,0808	0,1816	0,9196
2006	0,4507	0,1840	0,0337	0,2640	0,8943
2007	0,4046	0,1453	0,1143	0,3482	0,8671
2008	0,4361	0,2631	0,1485	0,3803	0,8074
2009	0,3861	0,2404	0,1167	0,3048	0,7625
2010	0,3810	0,2626	0,1731	0,2512	0,7598
2011	0,4358	0,3300	0,2120	0,2432	0,7677
2012	0,4538	0,2935	0,2316	0,2318	0,7844
2013	0,4958	0,2219	0,2871	0,2485	0,7809
2014	0,4598	0,1878	0,2606	0,2698	0,7761

Source: Authors' Calculations.

The trends of the RSCA index in five sectors from 2000 to 2014 are shown in Figure 1.

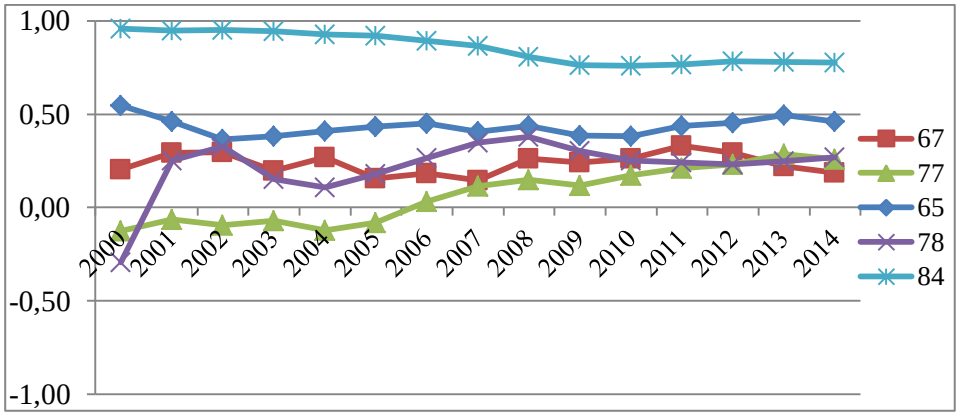


Figure 1. RSCA Index Trends of Five Sectors in Turkey (2000-2014)

Source: Created by Authors.

As shown in Figure 1, whereas the 84 coded sector had the highest comparative advantage, the 77 coded sector had the lowest comparative advantage for the period from 2000 to 2014 in Turkey. Although this sector had a comparative disavantage until 2006, it had a comparative advantage in 2006 and after 2006.

The TBI index results are shown in Table 8. According to the TBI index results, Turkey was a net-exporter in the 65 (Textile yarn, fabrics, made-up articles, n.e.s. and related products) and 84 (Articles of apparel and clothing accessories) coded sectors from 2000 to 2014. In other words, Turkey had specialization in export in the said sectors and period. Furthermore, Turkey was a net-importer in the 77 (Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof) coded sector from 2000 to 2011.

Table 8. The Revealed Comparative Advantage of Turkey in World Scale According to TBI Index

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	0,2672	-0,1306	-0,4349	-0,5650	0,9224
2001	0,3448	0,1619	-0,2007	0,1174	0,9308
2002	0,1984	0,1253	-0,2673	0,1591	0,9321
2003	0,2093	0,0091	-0,2572	-0,0385	0,9186
2004	0,2132	0,0599	-0,3290	-0,1074	0,8900
2005	0,2288	-0,0731	-0,3029	-0,0480	0,8752
2006	0,2362	-0,0586	-0,2080	0,0256	0,8330
2007	0,1962	-0,0839	-0,1151	0,1322	0,7972
2008	0,2495	0,0568	-0,0630	0,1856	0,7196
2009	0,2416	0,0842	-0,0435	0,1529	0,6866
2010	0,1564	0,0253	-0,0686	0,0131	0,6364
2011	0,1754	0,0530	-0,0744	-0,0415	0,6200
2012	0,2637	0,0828	0,0165	0,0167	0,6844
2013	0,2830	-0,0271	0,0426	0,0011	0,6612
2014	0,2752	-0,0244	0,0521	0,0620	0,6757

Source: Authors' Calculations.

The trends of the TBI index from 2000 to 2014 in five sectors are shown in Figure 2. According to Figure 2, the trends of the TBI index are the same as those of the RSCA index.

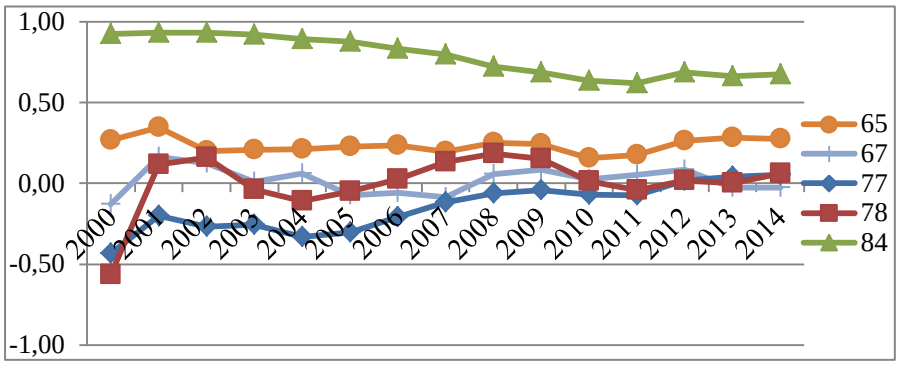


Figure 2. TBI Index Trends of Five Sectors in Turkey (2000-2014)

Source: Created by Authors.

The place of the RSCA and TBI index values in product mapping are shown in Table 8.

Table 8. The Place of RSCA and TBI Index Values in Product Mapping

Group A: Comparative Advantage and Net-Exporter

Group B: Comparative Advantage and Net-Importer

Group D: Comparative Disadvantage and Net-Importer

Source: the place of RSCA and TBI index values in product mapping was created by us and the percentage of sectors in Group A, Group B, Group C and Group D was calculated by us.

According to Table 8, from 2000 to 2014, the sectors coded 65 and 84 are placed in Group A. Group A consists of both the comparative advantage and export- specialization sectors; Turkey had a comparative advantage and was also a net exporter in these sectors.

Years	Sectors				
	65	**67**	**77**	**78**	**84**
2000	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group D: RSCA<0, TBI<0	Group D: RSCA<0, TBI<0	Group A: RSCA>0, TBI>0
2001	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group D: RSCA<0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2002	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group D: RSCA<0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2003	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group D: RSCA<0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0
2004	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group D: RSCA<0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0
2005	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group D: RSCA<0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0
2006	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2007	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2008	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2009	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2010	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2011	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0
2012	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2013	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0
2014	Group A: RSCA>0, TBI>0	Group B: RSCA>0, TBI<0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0	Group A: RSCA>0, TBI>0

According to our calculation, an average of 69,33 percent of the sectors are in Group A from 2000 to 2014. About 21,33 percent of the sectors are in Group B (Group B consists of sectors which have a comparative advantage but Turkey is a net-importer or does not have export- specialization). Furtermore, around 9,33 percent of the sectors are in Group D (Group D consists of sectors which have a comparative disadvantage and the country is a net-importer or does not have export- specialization). There are no sectors in Group C. In other words there is no sector which has a comparative disadvantage and export- specialization.

The product mapping of the five sectors is shown in Figure 3 for the year 2000.

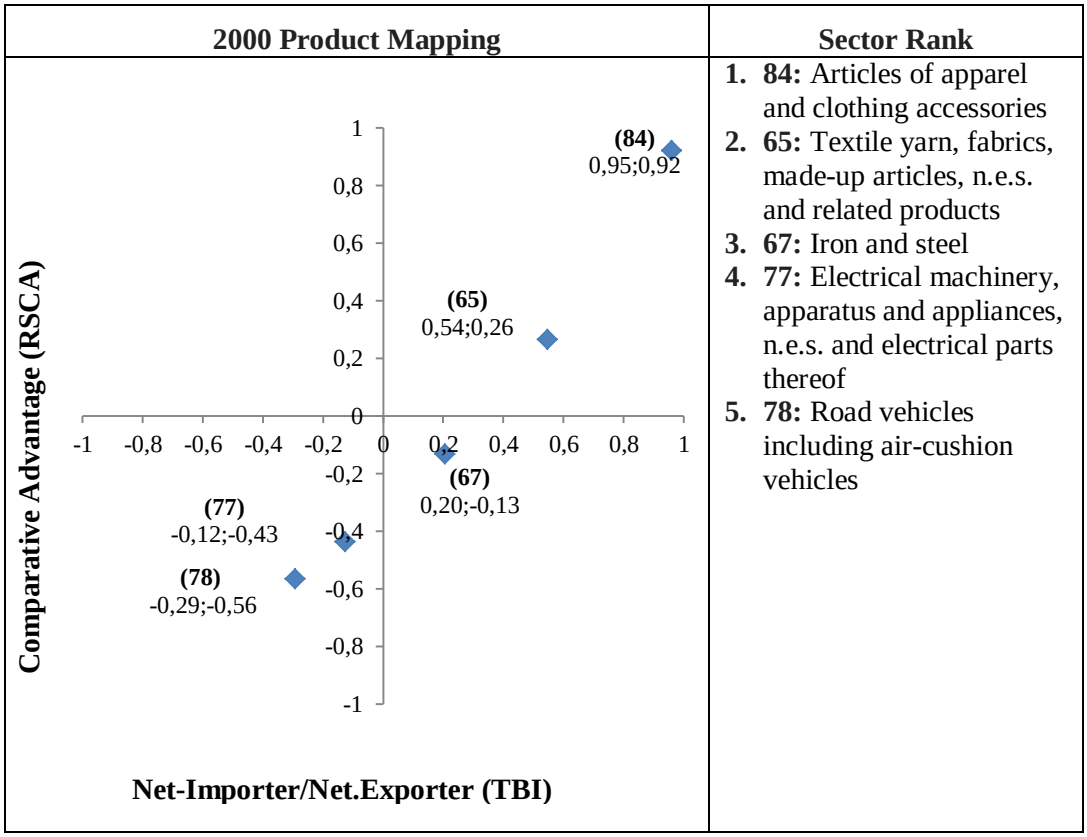


Figure 3. The Product Mapping of Exporter Sectors in Turkey and Sector Rank (2000)

Source: Created by Authors.

In the product mapping for the year 2000, the 65 and 84 coded sectors are located in Group A. Turkey had both a comparative advantage and was a net-exporter in these sectors. In other words, they were the strongest and the most competitive industries in the Turkish economy for the year 2000. The 67 coded sector is located in Group B. This sector had a comparative advantage but it was a net-importer. The 77 and 78 coded sectors are located in Group D. These sectors had a comparative disadvantage and they were net-importers. There is no sector in Group C.

The product mapping of the five sectors is shown in Figure 4 for the year 2014. As shown in Figure 4, the 84, 65, 78 and 77 coded sectors are located in Group A. Eighty percent of the sectors are in Group A. These sectors had both a comparative advantage and were also net-exporters. They were the strongest and the most competitive industries. The 67 coded sector is located in Group B. This sector had a comparative advantage but was a net-importer. There are no sectors in Group C and Group D. While the 77 and 78 coded sectors are located in Group D for the year 2000, the same sectors are located in Group A for the year 2014. It is said that these sectors were not competitive for the year 2000 but were competitive in 2014.

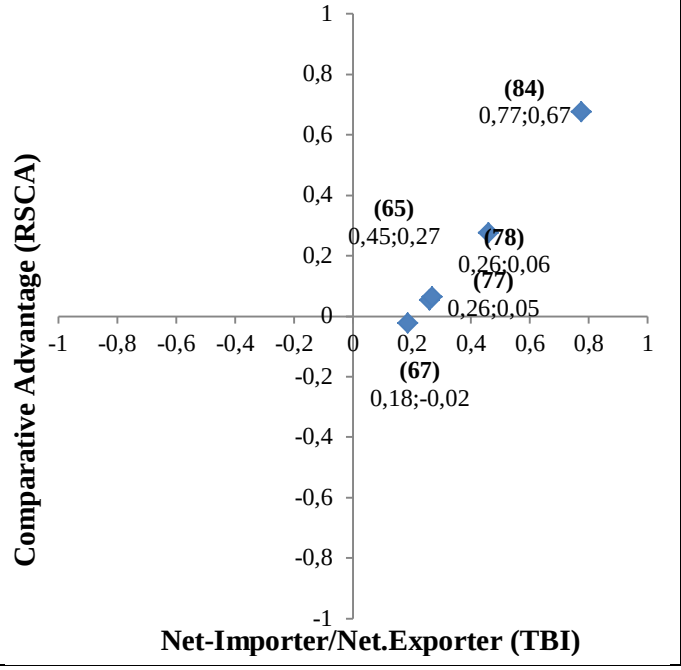
2014 Product Mapping	Sector Rank
	1. **84:** Articles of apparel and clothing accessories 2. **65:** Textile yarn, fabrics, made-up articles, n.e.s. and related products 3. **78:** Road vehicles including air-cushion vehicles 4. **77:** Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof 5. **67:** Iron and steel

Figure 4. The Product Mapping of Exporter Sectors in Turkey and Sector Rank (2014**)**

Source: Created by Authors.

The product mapping of the five sectors for the average of 2000-2014 is shown in Figure 5.

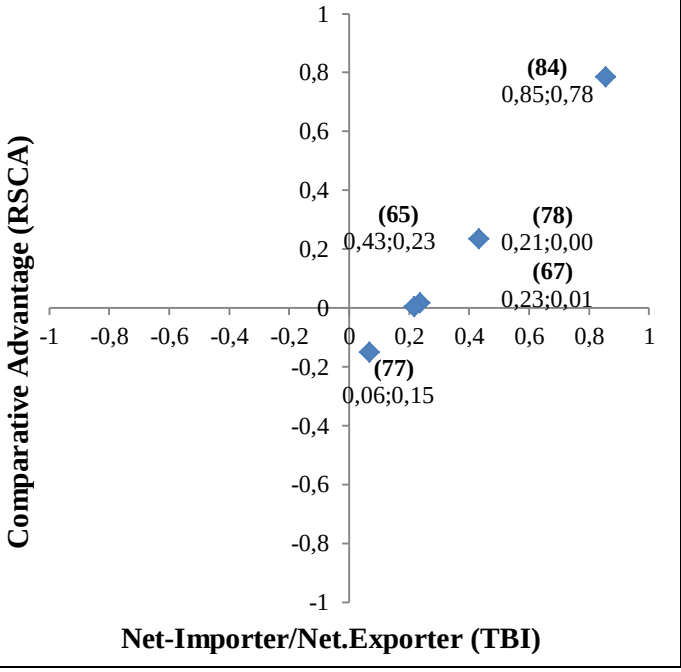
Average 2000-2014 Product Mapping	Sector Rank
	1. **84:** Articles of apparel and clothing accessories 2. **65:** Textile yarn, fabrics, made-up articles, n.e.s. and related products 3. **78:** Road vehicles including air-cushion vehicles 4. **67:** Iron and steel 5. **77:** Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof

Figure 5. The Product Mapping of Exporter Sectors in Turkey and Sector Rank

(The Average of Sectors for 2000- 2014)

Source: Created by Authors.

As shown in Figure 5, the 84, 65, 78 and 67 coded sectors are located in Group A. These sectors had both a comparative advantage and were net-exporters. In other words, these sectors were the strongest and the most competitive industries in the Turkish economy. The 77 coded sector is located in Group B. This sector had a comparative advantage but was a net-importer. There are no sectors in Group C and Group D.

4. Conclusion

In this paper we presented an analysis of the competitiveness of the Turkish export sectors in global markets for the period 2000-2014. We used the Balassa Index, Vollrath Indices, RSCA and TBI indices to measure Turkey's competitiveness. We made an analytical tool namely the "products mapping" which was created Widodo (2009) and also using RSCA and TBI index values which is suitable for analyzing comparative advantage and trade balance.

According to the result of the indices, the export sectors which were analyzed had a substantial comparative advantage. In the product mapping of the five sectors for the average of 2000-2014, the 84, 65, 78 and 67 coded sectors were located in Group A. These sectors had both a comparative advantage and were net-exporters. In other words, these sectors were the strongest and the most competitive industries in the Turkish economy. The competitiveness ranking of the analyzed sectors in terms of comparative advantage and trade balance is as follows: 84, 65, 78, 67 and 77 in the said period for Turkey.

It is expected theoretically that as export increases, so too does competitiveness. We conclude that there is a positive relationship between comparative advantage and trade balance. If a country has a higher comparative advantage for a specific product, this will lead to the country being a higher net-exporter. In contrast, if a country has a higher comparative disadvantage for a specific product, this will lead to the country being a higher net-importer. The study results strongly support Ricardo's comparative advantage theory.

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