

Nazire Deniz Yilmaz,
*Hacer Simay Karaalp-Orhan

Comparative Advantage of Textiles and Clothing: Evidence for Top Exporters in Eastern Europe

DOI: 10.5604/12303666.1167411

Faculty of Engineering,
Department of Textile Engineering
E-mail: ndyilmaz@pau.edu.tr

*Faculty of Economics and Administrative Sciences,
Department of Labor Economics
and Industrial Relations
Pamukkale University
Kınıklı Kampüsü, 20160 Merkez/Denizli, Turcja

Abstract

The comparative advantage and intra-industry trade of five countries: Czech Republic, Hungary, Poland, Romania and Turkey, are analyzed in the global textile and clothing markets by employing Balassa's revealed comparative advantage (RCA) index and intra-industry trade (IIT) index for the period 2002-2013. The results have revealed that while Turkey is the only one among the countries selected to have comparative advantage in the global textile market, Romania joins Turkey in this in the world's clothing market. The comparative advantage of these two countries in the global clothing market presents a stronger declining trend compared to that in textiles, which is probably due to the entrance of cheap-labour eastern Asian countries into the global clothing market, as this market is more labor-intensive compared to textiles. Moreover, while a high intra-industry trade index is found in Czech Republic, Hungary and Poland, an inter-industry trade structure is observed in Romania for textiles and clothing. Turkey presents intra-industry specialisation in textiles, while possessing inter-industry trade structure in terms of clothing.

Key words: RCA, IIT, textiles, clothing, Czech Republic, Hungary, Poland, Romania, Turkey.

Introduction

In the economic development of nations, the textile and clothing industries play a significant role. Today, as well as the industrialisation age of 18th - 19th centuries, textile and clothing industries continue to contribute to the economic prosperity of countries with an inexpensive labour force [1, 2].

This study aims to analyse the current situation of Eastern European textile and clothing industries by analysing the comparative advantage and intra-industry trade structure of the major exporter countries of Eastern Europe in the global market. Turkey, Czech Republic, Poland, Romania and Hungary are the top five exporters among Eastern European countries in the global textile market. Within this context, revealed comparative advantage (RCA) and intra-industry trade (IIT) indices have been adopted in order to analyse the trade patterns and changes in the countries mentioned in the world textile and clothing markets during the period of 2002-2013. The RCA index, which is an export performance based index, tries to investigate the success in exporting of a country compared to the world or a group of countries [3, 4]. Although RCA remains an important determinant of international trade, the importance of intra-industry trade (IIT) has been increasing, especially in analyses of the integration of countries into international trade and export performance [5].

As a matter of fact, IIT analysis has also been carried out in this study in addition to RCA analysis.

General economic review of textile and clothing industries in selected countries

The Czech Republic is a high-income level OECD country with a gross national income (GNI) per capita of \$18,950 for the year 2013 [6]. Textile exports, totalling more than \$2.5 billion in 2013, accounted for 1.5% of total exports in that year [7]. The major export partner of the Czech Republic is Germany, followed by other European countries. According to the SITC Rev. 2 classification, the major textile products that the Czech Republic exported in 2012 with trade figures were special textile fabrics and related products (\$725,099,234), textile yarns (\$543,111,530), made-up articles and wholly or chiefly of textile materials (\$367,929,654); whereas the major clothing products were men's and boys' outerwear of textile fabrics not knitted or crocheted (\$465,174,205), under-garments, knitted or crocheted (\$254,372,664), and women's, girl's and infant's outerwear, textile, not knitted or crocheted (\$233,235,246) (with the codes 657, 651, 658, 842, 846 and 843, respectively) [8].

The 2013 value of GNI per capita of Hungary, an upper-middle income level country, was \$13,260 [6]. For the year

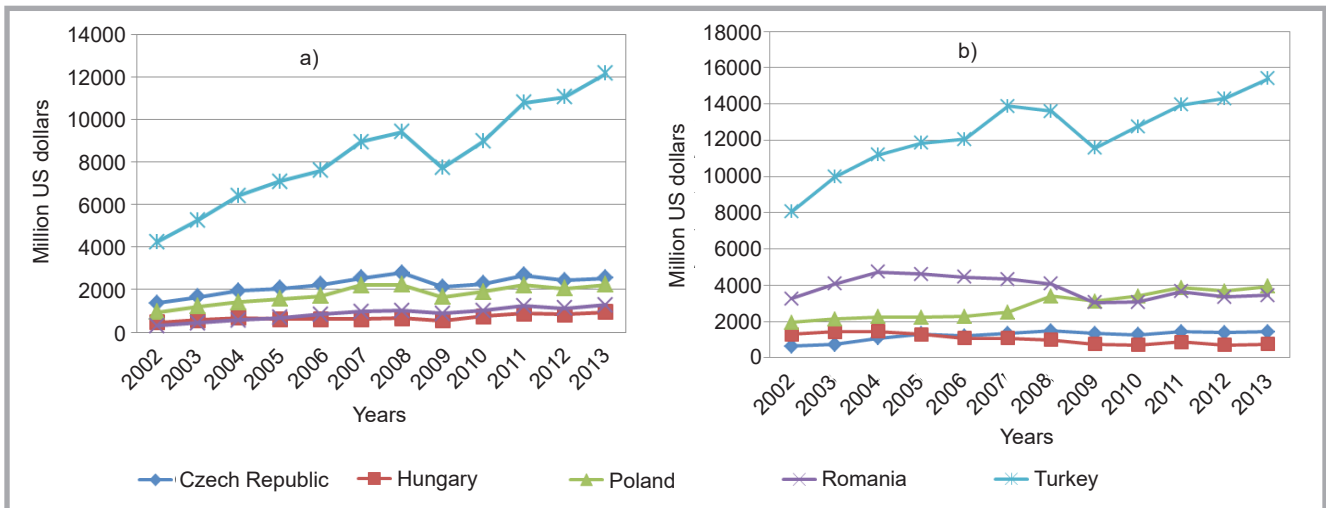


Figure 1. Textile (a) and clothing (b) exports of the countries selected; trading partner is the World based on WTO figures.

2013, textile and clothing exports accounted for around 0.8% and 0.6% of Hungarian total merchandise exports, respectively [7]. The major importer of Hungarian commodities is the European Union, with Germany as the leading country. In 2012, Hungary mainly exported special textile fabrics and related products (\$193,415,000), fabrics, woven, of man-made fibres (not narrow or special fabrics) (\$129,132,000) as well as textile yarns (\$118,536,000) in textiles; whereas under-garments -knitted or crocheted- (\$233,311,000), outerwear -knitted or crocheted, not elastic nor rubberised- (\$131,734,000) and women's, girl's, infant's outerwear -textile, not knitted or crocheted- (\$111,187,000) as clothing products (with the codes 657, 653, 651, 846, 845 and 843, respectively) [8].

Poland is a high-income level OECD country that had a GNI per capita of \$13,240 in 2013 [6]. Poland ranked 22nd among the greatest exporters in the global textile market. Textile and clothing exports accounted for 1.1% and 1.9% of the Polish total merchandise exports for the year 2013, respectively [7]. The major export partner of Poland is Germany, followed by three other European countries and the Russian Federation. The top three textile export products in 2012 were made-up articles -wholly or chiefly of textile materials- (\$639,276,645), special textile fabrics and related products (\$370,472,818) as well as textile yarns (\$360,935,796); and the top three clothing export products were women's, girl's, infants' outerwear -textile, not knitted or crocheted- (\$1,152,836,223), outerwear -knitted or crocheted, not elas-

tic nor rubberized- (\$856,857,785), and under-garments -knitted or crocheted- (\$562,085,243) (with the codes 658, 657, 651, 843, 845 and 846, respectively) [8].

Romania, an upper middle-income level country, had a GNI per capita of \$9,060 in the year 2013 [6]. Romania ranked 24th among the greatest exporters in the global textile market. Textile and clothing exports accounted for 1.9% and 5.2% of the Romanian total merchandise exports for the year 2013, respectively [7]. The major export partner of Romania is Germany, followed by two other EU countries and Turkey. Romania's top three textile export products in 2012 were textile yarns (\$439,987,598), made-up articles -wholly or chiefly of textile materials- (\$325,604,342) and special textile fabrics & related products (\$118,545,367); while the major clothing products were women's, girls' and infants' outerwear -textile, not knitted or crocheted- (\$1,228,801,257), outerwear -knitted or crocheted, not elastic nor rubberised- (\$562,661,040) and under-garments -knitted or crocheted- (\$404,484,748) (with codes 651, 658, 657, 843, 845 and 846, respectively) [8].

Turkey, which is an upper-middle-income country, had a GNI per capita of \$10,970 in 2013 [6]. In the same year, textile and clothing products constituted around 8% and 10% of total Turkish merchandise exports, respectively [7]. Turkey holds an important position in the world market for textile and clothing products [9]. In the year 2012, Turkey ranked 7th in terms of textile exports and 6th in terms of clothing exports in the global market [7]. Similar to the other Eastern Euro-

pean countries, the major export partner of Turkey is Germany. Germany was followed by two Middle Eastern Countries and then by the United Kingdom. Apart from other countries, the major textile export products of Turkey were floor coverings, (\$1,999,697,816), made-up articles -wholly or chiefly of textile materials- (\$1,890,728,156) and fabrics -woven, of man-made fibres- (not narrow or special fabrics) (\$1,752,188,00). The major clothing export products of Turkey resemble those of other countries mentioned i.e. under-garments -knitted or crocheted- (\$4,009,761,399), outerwear -knitted or crocheted, not elastic nor rubberised- (\$3,783,243,438) and women's, girls', infants' outerwear, -textile, not knitted or crocheted- (\$3,101,872,244) (with the codes 659, 658, 653, 846, 845 and 843, respectively) [8].

Textile and clothing export figures of the countries selected to the global markets are given in **Figure 1**.

While the export numbers of Turkey follows an increasing trend, that of the other countries show a more steady line. The effect of the 2008 financial crisis affected the export trends with deep decreases following that year, as shown in the graph, especially for Turkey. When the export graphics are investigated in detail, it can be seen that the trend of Turkey against the leading exporters of Eastern Europe resembles that of China against the leading textile and clothing exporters in the world [10].

With regard to aggregate trade in textiles, all trade flows, with the exception of the 2008 global financial crisis, showed

Table 1. Aggregate trade of textiles in selected countries (Million US \$); **Note:** Authors' own calculation based on WTO figures.

Countries	Number of inhabitants, millions	2002					2013				
		Textile exports	Share of total exports, %	Textile imports	Share of total imports, %	Trade balance	Textile exports	Share of total exports, %	Textile imports	Share of total imports, %	Trade balance
Czech Republic	10.5	1.370	3.5	1.425	3.50	-54	2.539	1.572	2.374	1.65	165
Hungary	9.9	455	1.3	1.123	2.97	-667	949	0.878	1.203	1.20	-254
Poland	38.4	950	2.3	2.742	4.95	-1.791	2.242	1.109	4.256	2.07	-2.014
Romania	19.6	310	2.2	2.375	13.3	-2.064	1.271	1.931	3.318	4.52	-2.047
Turkey	76.7	4.244	11.7	2.839	5.5	1.405	12.156	8.009	6.789	2.69	5.367

Table 2. Aggregate trade of clothing in countries selected (Million US \$); **Note:** Authors' own calculation based on WTO figures.

Countries	2002					2013				
	Clothing exports	Share of total exports, %	Clothing imports	Share of total imports, %	Trade balance	Clothing exports	Share of total exports, %	Clothing imports	Share of total imports, %	Trade balance
Czech Republic	647	1.68	565	1.39	81	1.435	0.88	2.078	1.44	-643
Hungary	1.293	3.74	635	1.68	657	747	0.69	933	0.93	-186
Poland	1.936	4.70	816	1.47	1.119	3.936	1.94	4.053	1.97	-117
Romania	3.254	23.45	462	2.59	2.791	3.440	5.22	1.116	1.52	2.323
Turkey	8.056	22.34	283	0.54	7.773	15.407	10.15	3.139	1.24	12.268

growth from 2002 to 2013; however the share of textile in the total exports of all countries shows a decreasing trend (see **Table 1**). From 2002 to 2013, although the textile exports of the countries indicate an increasing period, their share in the total exports decreased.

The pattern of trade balances shows a division between Turkey and East European countries. While Turkey exhibits a trade surplus in textiles, Czech Republic, Hungary, Poland and Romania emerged as importers over the period. It could be said that although the textile industry has been going through an increasing period in the past decade for all countries, the decreasing share of textile in total exports indicates the increasing diversity of the export pattern of the countries. The clothing exports of the aforementioned countries are given in **Table 2**.

With regard to trade in clothing (see **Table 2**), while all countries acted as exporters in 2002, all became net importers except Turkey and Romania in 2013. Turkey and Romania, which are both upper-middle-income countries, have a significant share of clothing in total exports with 22.34% and 23.45% in 2002, respectively, but observing a significant decrease in the share of clothing in total exports a decade later. Apart from the other countries, Turkey is one of the leading exporter countries with an increasing trend; however, the importance of clothing in total exports experienced

a significant decrease similar to the other countries, as mentioned.

Methodology

The RCA and IIT analyses are based on annual time series data of textile and clothing exports obtained from the World Trade Organization (WTO) Total Merchandise Trade over the period 2002 to 2013.

Revealed comparative advantage

The “comparative advantage” notion has been adopted in order to analyse the trade pattern of the nations selected in international markets. Comparative advantage is defined as [11: p. 11]: “*the ability of a given economy to manufacture a product more efficiently than other countries do; it is reflected in the directions of export and import specialisations*”. Hence international trade data of the selected countries in the industries mentioned have been utilised to assess its comparative advantage in those particular industries. Balassa [12, 13] developed the ‘revealed comparative advantage’ (RCA) index in order to understand international trade. This measure tries to present success in the exporting of countries relative to the world or a group of countries [2]. The RCA index is calculated as shown in **Equation 1**:

$$RCA_{ij} = (X_{ij} / X_{it}) / (X_{nj} / X_{nt}), \quad (1)$$

where, X_{ij} denotes the export of commodity/industry j of country i , n the world or a

set of countries, and t all product groups. The RCA index states whether the share of a selected product group in a country's total exports is greater than that of the whole world or a group of countries. A country is considered to have comparative advantage if $RCA > 1$, and has comparative disadvantage if $RCA < 1$ [12, 13].

Intra-industry trade

The intra-industry trade (IIT) index which is proposed by Grubel and Lloyd [14], also known as the Grubel-Lloyd Index, is based on measuring the trade overlap for a given industry [15]. The IIT index measures trade between countries' intra-industry and inter-industry. The main explanation of IIT includes the diversity of consumer preferences, product differentiation and economies of scale [16]. The IIT index is calculated as shown in **Equation 2**:

$$IIT_{ijt} = 1 - \frac{|X_{ijt} - M_{ijt}|}{X_{ijt} + M_{ijt}}, \quad (2)$$

$$i = 1, \dots, n_j; j = 1, \dots, N; t = 1, \dots, T$$

where, X_{ijt} stands for the exports of country i of commodity/industry j at time t , and M_{ijt} represents the import of this good for commodity/industry j , at t . The IIT index lies between 0 and 1. A large IIT value close to unity implies greater trade between firms in the same industry or the simultaneous export and import of the same group of products by the same country. However, values close to 0 indi-

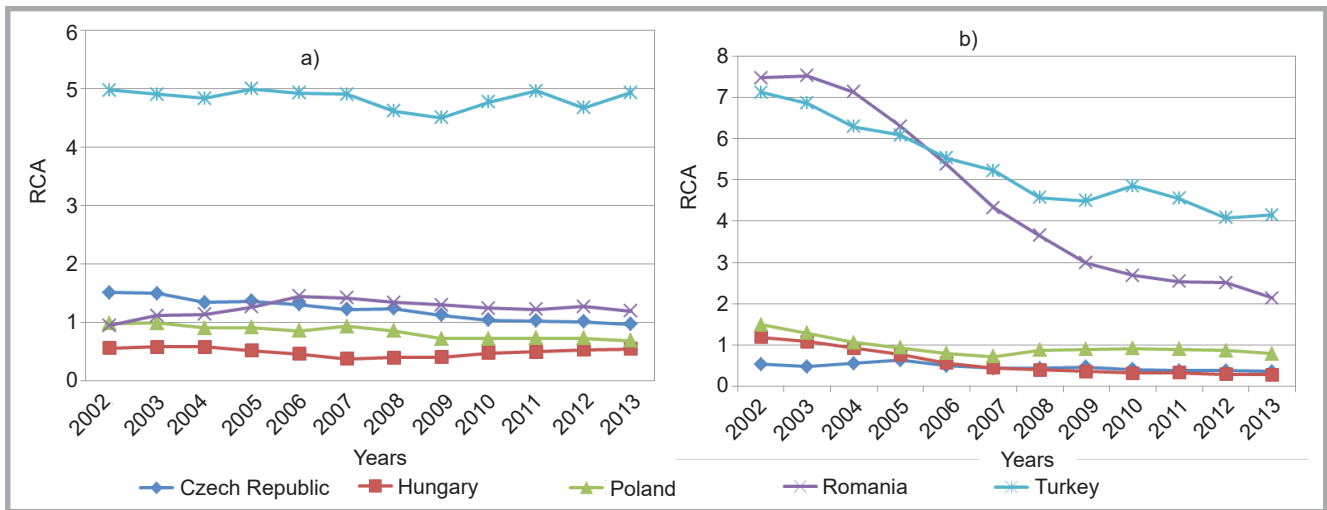


Figure 2. RCA indices of the countries selected in the world market in terms of textiles (a) and clothing (b). Calculated based on WTO figures.

Table 3.a. Summary of the revealed comparative advantage of selected countries in the global textile market for 2002 - 2013; **Note:** Authors' own calculation based on WTO figures.

RCA	Czech Republic	Hungary	Poland	Romania	Turkey
Average	1.215	0.490	0.831	1.237	4.828
At the beginning	1.503	0.557	0.976	0.946	4.969
At the end	0.967	0.540	0.683	1.188	4.926
Change, %	-35.668	-3.083	-30.062	25.598	-0.853

Table 3.b. Summary of the revealed comparative advantage of selected countries in the global clothing market for 2002 - 2013; **Note:** Authors' own calculation based on WTO figures.

RCA	Czech Republic	Hungary	Poland	Romania	Turkey
Average	0.468	0.584	0.967	4.553	5.317
At the beginning	0.536	1.194	1.500	7.472	7.118
At the end	0.363	0.283	0.796	2.136	4.150
Change, %	-32.170	-76.322	-46.893	-71.409	-41.702

cate an inter-industry trade structure [17, 18]. The IIT value is found to be 0 if a country only exports or imports the given product. Countries with similar factor endowments are expected to reveal intra-industry trade. Moreover the IIT suggests to what extent the economy in question is already integrated into the world market and indicates the degree of liberalisation that the economy has already realised throughout the economic development process [4, 19]. Moreover faster growth of IIT levels is observed within trade between the member countries of a customs union or other regional trading arrangements than in the trade of countries without any integration [20].

Limitations of the study

The limitations of the current study are based on the availability of export data. The latest export figures for the countries studied at the time of the research belonged to the year 2013.

Empirical results

Revealed comparative advantage of selected countries

This section represents the results of RCA indices of the countries in ques-

tion with respect to the world textile and clothing industries.

The RCA indices of the countries selected in the world market in terms of textiles are given in **Figure 2**. The countries selected have close comparative advantage values in terms of the textile industry in the world except Turkey, as seen from the figure. All five countries have more or less steady revealed comparative indices throughout the period. While Turkey presents strong comparative advantage, Romania is weak in this; the Czech Republic shows neither advantage nor disadvantage, while Hungary and Poland possess disadvantage in terms of the textile industry in the world. In **Table 1**, it is seen that all of the studied countries face slight declines in the comparative advantage index, except Romania, which had a slight increase.

RCA indices of the countries selected in the world market in terms of clothing are given in **Figure 2**. The countries selected have close comparative advantage values in terms of the clothing industry in the world except Turkey and Romania, as seen from the figure. Although Turkey and Romania have higher but declining RCA indices, all the other three countries

have more or less steady revealed comparative indices throughout the period. According to the graph, Turkey and Romania have strong but weakening comparative advantages, whereas the Czech Republic, Hungary and Poland possess disadvantage in terms of the Clothing industry in the world. As seen in **Table 3.a**, all countries have declining comparative advantage indices. The decreasing trend of comparative advantage indices is probably due to the entrance of inexpensive labour countries to the global clothing market. The clothing industry has a more labour-intensive structure compared to the textile industry, which is more technology-intensive [20, 21]. This fact is supported by the point that a similar strong decline is not observed in the textile comparative advantage indices.

Intra-industry trade of selected countries

This section represents the results of the average IIT indices of the countries in question with respect to the world textile and clothing market over the period 2002 - 2013. Although the textile industry was considered as labour intensive and characterised by inter-industry trade in the early days, in time the industry has evolved into a capital or technology in-

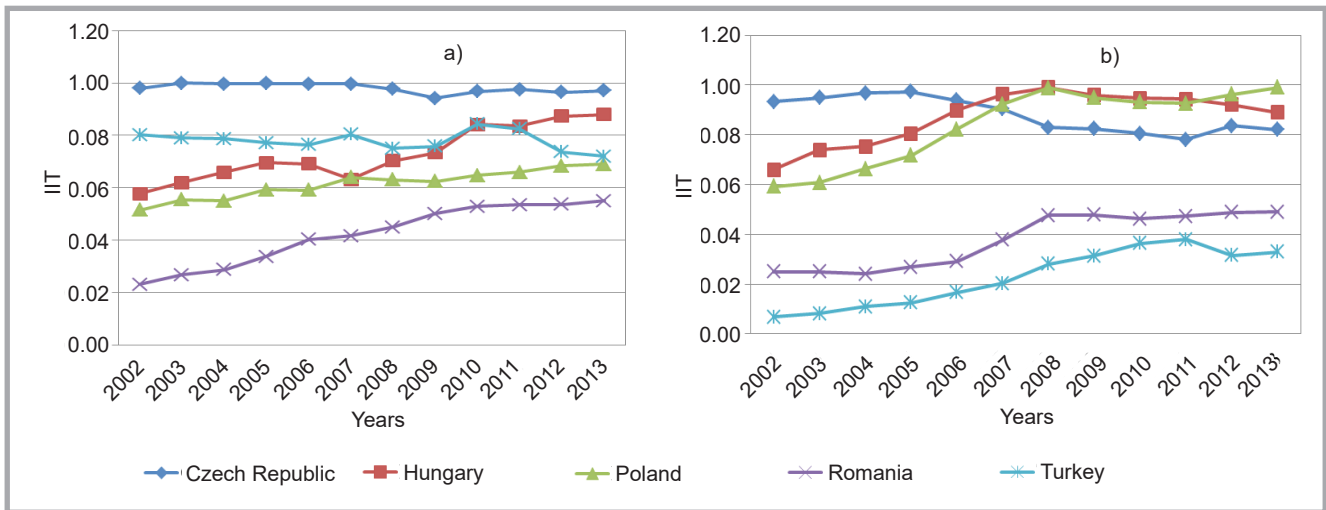


Figure 3. IIT indices of the countries selected in the world market in terms of textiles (a) and clothing (b). Calculated based on WTO figures.

Table 4.a. Summary of the IIT of the countries selected in the global textile market for 2002 - 2013; **Note:** Authors' own calculation based on WTO figures.

IIT	Czech Republic	Hungary	Poland	Romania	Turkey
Average	0.980	0.729	0.615	0.421	0.779
At the beginning	0.980	0.577	0.515	0.231	0.802
At the end	0.966	0.882	0.690	0.554	0.717
Change, %	-1.054	52.471	34.005	137.608	-10.184

Table 4.b. Summary of the IIT of the countries selected in the global clothing market for 2002 - 2013; **Note:** Authors' own calculation based on WTO figures.

IIT	Czech Republic	Hungary	Poland	Romania	Turkey
Average	0.880	0.872	0.839	0.379	0.229
At the beginning	0.933	0.659	0.593	0.249	0.068
At the end	0.817	0.889	0.985	0.490	0.339
Change, %	-12.078	35.025	66.902	96.801	385.755

tensive industry which is characterized by intra-industry trade. Due to the many segments of the textile industry, both inter and intra industries can be observed in the countries [16].

The three East European countries which have a high IIT index in both textiles and clothing are the Czech Republic, Hungary and Poland. While the Czech Republic's intra-industry trade in textiles is the highest among all the countries, the Czech Republic, Hungary and Poland's intra-industry trade in clothing have values close to unity. The IIT indices in textiles and clothing show an increase for all countries except the Czech Republic, which is already high.

Romania indicates an average inter-industry trade structure in 2002 - 2013 for both textile and clothing products with low IIT values. However, compared to the other countries, the IIT value of textile and clothing shows a significant increase in Romania, reaching values around 0.5. This indicates Romania's economic integration into world market through textiles and clothing while becoming similar in factor endowments, and thus with income levels similar to

the countries that constitute the world's clothing market.

As seen in **Table 4.a**, all countries have increasing intra-industry trade indices in textiles over the period of 2002 - 2013, except Turkey and Romania. Although Turkey has significant intra-industry specialisation in textiles, there is a floating trend observed especially after the financial crisis. Turkey not only exports textile products but also imports a significant amount of input and intermediate goods such as natural and synthetic fibres, yarns and fabrics [8] from countries with an abundance of cheap labour to provide competitiveness in the global clothing market based on cost-effectiveness.

When RCA and IIT trends are compared, it is seen that the two indices follow reverse trends, especially for the clothing industry. In this specific industry, the countries with a cost effective labour force enjoy intensive exportation with high RCA and low IIT values. As the income of these countries increases, the trade loses its unilateral structure, reflected in the increment of IIT, and the decline in RCA indices show a more diverse export portfolio.

The results indicate that while the figures of other countries follow somewhat steady trends, Romania and Turkey possess moving figures in the textile and clothing industries. RCA values for Romania and Turkey's clothing declines with increasing IIT values for that particular industry. Romania's IIT values for textile also increases, whereas that of Turkey is already high. These findings urge us to expect more complicated export mixes for Turkey and Romania where clothing products take a smaller share, with the two countries importing more clothing products and Romania more textile products than at present as well.

Conclusions

Five countries of Eastern Europe: Turkey, the Czech Republic, Poland, Romania and Hungary, have been analysed in terms of their comparative advantage and intra-industry trade structure in the global textiles and clothing markets by employing Balassa's revealed comparative advantage (RCA) index and intra-industry trade (IIT) index for the period 2002 - 2013. The results have revealed that while Turkey is the only one among the countries selected to have comparative advantage in the global textile mar-

ket, Romania joins Turkey in comparative advantage in the world's clothing market. The comparative advantage of all the countries selected in the global clothing market presents a stronger decline compared to that in textiles. The overall decreasing comparative advantage in the clothing industry is probably due to the entrance of cheap-labour eastern Asian countries into the global clothing market, which is more labour-intensive compared to textiles. Moreover while a high intra-industry trade index is found in the Czech Republic, Hungary and Poland, an inter-industry trade structure is observed in Romania for textile and clothing. Turkey presents intra-industry specialisation only in textiles, while it possesses an inter-industry trade structure in terms of clothing.



References

- Karaalp HS, Yılmaz ND. An Assessment of Trends In Comparative Advantage And Competitiveness Of Turkish Textile And Clothing Industries In The Enlarged EU Market. *Fibres & Textiles in Eastern Europe* 2012; 20, 3: 8-11.
- Karaalp HS, Yılmaz ND. Comparative Advantage of Textiles and Clothing: Evidence for Bangladesh, China, Germany and Turkey. *Fibres & Textiles in Eastern Europe* 2013; 21, 1: 14-17.
- Siggel E. International Competitiveness and Comparative Advantage: A Survey and a Proposal for Measurement. *Journal of Industry Competition and Trade* 2006; 6, 2: 137-159.
- Yılmaz B. The Foreign Trade Pattern and Foreign Trade Specialization in the European Union: A Comparison of Six New Member/Candidate Countries and the EU/15. *Eastern European Economics* 2005; 43, 5: 74-100.
- Freudenberg M. and Lemoine F. Central and Eastern European Countries in the international division of labour in Europe, *CEPII Working Paper 5* 1999; 18.
- World Bank, Country Classifications, 2014, <http://data.worldbank.org/country>, [Retrieved 20.2.2015]
- World Trade Organization (WTO), Time Series on International Trade, 2014, <http://stat.wto.org/Statistical-Program/WSDDBStatProgramHome.aspx?Language=E>, [Retrieved 20.2.2015]
- UNComtrade, United Nations Commodity Trade Statistics Database, 2011, <http://comtrade.un.org/db/mr/daReportersResults.aspx>, [Retrieved 14.4.2014]
- Milasius R, Mikucioniene D. Comparative Analysis of the Textile and Clothing Industry in the EU and Turkey. *Fibres & Textiles in Eastern Europe* 2014; 22, 3: 8-16.
- Yılmaz ND, Karaalp HS. Türk Tekstil ve Hazır Giyim Sektörlerinin Uluslararası Piyasalardaki Rekabet Gücü Üzerine Bir İnceleme. *İstanbul Üniversitesi İktisat Fakültesi Mecmuası* 2012; 62, 1: 103-125.
- Koszewska M. International Competitiveness of the Polish Protective Clothing Manufacturers in Face of European Integration. *Fibres & Textiles in Eastern Europe* 2005; 13, 4: 11-15.
- Balassa B. Trade Liberalization and 'Revealed' Comparative Advantage. *The Manchester School of Economics and Social Studies* 1965; 33, 2: 99-123.
- Balassa B. Revealed Comparative Advantage Revisited: An Analysis of Relative Export Shares of the Industrial Countries (1953- 1971). *The Manchester School of Economics and Social Studies* 1977; 45, 4: 327-344.
- Grubel HG, Lloyd PJ. The Empirical Measurement of Intra-Industry Trade. *Economic Record* 1971; 47: 120, 494-517.
- Erlat G, Erlat H, Şenoğlu D. Measuring vertical and horizontal intra-industry trade: The case for Turkey. *Topics in Middle Eastern and North African Economies Electronic Journal* 2007; 9, <http://www.luc.edu.orgs/meea>, [Retrieved: 29.06.2014]
- Kandoğan Y. Intra-industry Trade of Transition Countries: Trends and Determinants. *Emerging Markets Review* 2003; 4, 3: 273-286.
- Karaalp HS. Competitiveness of Turkey in Eurasia: A Comparison with CIS Countries. *China-USA Business Review* 2011; 10, 9: 727-744.
- Marks A. Intra-Industry Trade and Adjustment Costs in the Australian Textile, Clothing and Footwear and Motor Vehicle Industries: A Comparative Case Study Approach, *Economic Papers* 2009; 28, 4: 323-336.
- Cernoša S. Horizontal and Vertical Intra-Industry Trade between the Former CEFTA Countries and the European Union. *Managing Global Transitions*, 2007; 5, 2: 157-178.
- Kurumer G. *Clothing production and technology*. 2nd ed. Turkey: Printer Offset, p. 500, 2012.
- Yılmaz ND, Karaalp HS, Akgül S. Trends in Global Textile and Clothing Market: Comparative Advantage of Nations. In: *XI International Scientific Conference IMTEX'2011*, Lodz, Poland, 7-8 November 2011, pp. 125-128, Lodz: Technical University of Lodz, Faculty of Material Technologies and Textile Design.

Received 07.07.2014 Reviewed 23.02.2015



Institute of Biopolymers and Chemical Fibres

*FIBRES &
TEXTILES
in Eastern
Europe
reaches all
corners of the
world!
It pays to
advertise your
products
and services in
our magazine!
We'll gladly
assist you in
placing your
ads.*

FIBRES & TEXTILES in Eastern Europe

ul. Świdowska 19/27
90-970 Łódź, Poland

Tel.: (48-48) 638-05-00
637-05-10

Fax: (48-48) 637-05-01

e-mail:

ibwch@ibwch.lodz.pl

inf@ibwch.lodz.pl

Internet:

<http://www.fibres.lodz.pl>