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EFFECTS OF FOREIGN DIRECT INVESTMENT ON TURKEY-EU28 INTRA-INDUSTRY TRADE[1]

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ABSTRACT

This study aims to examine the distribution, progress and determinants of total (IIT), horizontal (HIIT) and vertical intra-industry trade (VIIT) between Turkey and EU28 and impact of foreign direct investment on IIT in 2005-2016 period. According to empirical findings, although the share of IIT in Turkey's trade shows an increase, trade structure is mainly inter-industry. Results show that, there is a transition from one way trade intensive structure to a structure that low quality VIIT gains importance. When, Turkey's total IIT with EU28 is compared with the World and non-EU28 economies, it is seen that one-way trade and low quality VIIT is higher; high quality VIIT and HIIT are at lower levels. In the model, it is confirmed that, IIT is in a positive relationship with market size, commerical proximity, trade openness and in a negative relationship with level of economic development. Foreign direct investment affects the low quality VIIT negatively and high quality VIIT positively; in other IIT models there is no significant statistical effect.

Keywords: Intra-industry trade, vertical intra-industry trade, horizontal intra-industry trade, panel data analysis.

[1]In this article, a part of the PhD dissertation prepared by the Author was used.

INTRODUCTION

Globalisation flow, which gains momentum after the 2nd World War, improved international trade and economic integrations drastically. Traditional foreign trade theories focused on the inter industry trade have become insufficient to explain these new emerged and complex trade flows and types. Thus, besides the traditional foreign trade based on specialisation and division of labour, two way trade of similar but differentiated products was started to be observed. Today, it can be seen that this new trade pattern which was named intra-industry trade constitutes an important part of the World trade. In accordance with different industry classifications, it is estimated that intra-industry trade constitutes 25% to 50% of the World trade (Krugman et al., 2018, p.205-206) Consumer welfare gain from this relatively new trade type is considerably greater compared with inter industry trade. In a research which covers the period of 1972-2001, it is observed that imports of The United States increased 3 times. In line with increasing number of product variety, consumer welfare is improved by 2.6% of the GDP of The United States (Krugman et al., 2018, s.207). When the size of the GDP of The United States is taken into account, it can be concluded that this welfare gain is important.

On the other hand, foreign direct investments have started to increase significantly at global level, especially after the middle of 1990's. 2017 financial data shows that the foreign direct investment at global level is 1.43 Trillion U.S. Dollars. In the same year, greenfield investments, which refer to establishing new operations and factories in a country, are 720 Billion U.S. Dollars while brownfield investments, which refer procurement of an existing company, are 694 Billion U.S. Dollars (UNCTAD, 2018:2) 49.79 percent of the foreign direct investments is made to developed countries while the share of developing countries and transition economies are 46.92 and 3.23 percent respectively. Turkey is ranked 13th among developing countries, 8th in Asia region and 26th in all countries in the World, in terms of foreign direct investment inflows in 2017. It can be deduced that Turkey has a good performance compared with the other countries in the ranking of foreign direct investment inflows. However, 60 and 78 percent of foreign direct investment inflows goes to top 10 and top 20 countries in the ranking, respectively. Therefore, it can be argued that Turkey's share in global scale is relatively limited. When the geographical distribution of foreign direct investments is examined, it can be seen that 75 percent of inflows are made from Europe, 18 and 7 percent of it come from Asia and America respectively. (UNCTAD, 2018:184-191)

Foreign direct investments can be made with the motive of increase in productivity or market seeking purposes as well as using the invested countries as an export platform or make them a link in the global value chain. If FDI aims to increase productivity, intra-industry trade will be affected positively since the number of products and variety will increase. On the other hand, FDI with the market seeking motivation can replace the trade and cause a negative effect. When a Multi-National Company creates its production chain in different countries with its investments, "fragmentation theory" can be mentioned. Jones et al. (2002:69) defines the international fragmentation as distribution of vertically integrated production processes to different countries. If this

fragmentation occurs in the same industry category, it can contribute to increase in intra-industry trade. In this context, foreign direct investments can affect the intra-industry trade negatively or positively in line with their motives.

European countries and the European Union are Turkey's biggest trade partner and according to financial data given above, these economy blocs are also her biggest investor. This situation shows the importance of examination of trade and invesment patterns between Turkey and European Union. Therefore, this study aims to examine the distribution, progress and determinants of total (IIT), horizontal (HIIT) and vertical intra-industry trade (VIIT) between Turkey and EU28 and the impact of foreign direct investment on IIT in 2005-2016 period.

LITERATURE REVIEW

In the literature, there are several studies which utilized econometric tools for the purpose of examination of relationship between foreign direct investments and total, horizontal, vertical intra-industry trade. Caves (1981), Balassa (1986a), Balassa and Bauwens (1987), Sharma (2000), Xing (2007) have found that there is a negative relationship between total intra-industry trade and foreign direct investments, while Sohn ve Zhang (2005) conclude the same results between vertical intra-industry trade and foreign direct investments. Aturupane et al. (1999), Blanes and Martin (2000), Li et al. (2003), Moshirian and Sim (2005), Zhang et al. (2005), Zhang and Clark (2009), Türkcan and Ateş (2010), Thorpe and Leitâo (2013) examined total, horizontal and vertical intra-industry trade; Lee (1989), Wakasugi (1997), Andreosso-O'Callaghan and Bassino (2001), Okubo (2007), Xing (2007) (between Japan – China) researched the total intra-industry trade; Fukao et al. (2003), Zhang and Clark (2009), Yoshida et al. (2009), Türkcan and Ateş (2011), Ambroziak (2012) investigated vertical intra-industry trade; Pittiglio and Reganati (2005) analyzed vertical, low and high quality vertical intra-industry trade; Ambroziak (2012) studied horizontal intra-industry trade and their relationship with foreign direct investments. They observed a positive relationship between different types of intra-industry trade and foreign direct investments.

Although, there are studies focused on the calculation and determinants of total, horizontal and vertical intra-industry trade in the global literature, analyses for Turkey are relatively limited. The first article that examined the horizontal and vertical intra-industry trade in Turkey was conducted by Şimşek (2005). Şimşek (2005) investigated Turkey's intra-industry trade with OECD and the World while Erün (2010) used European Economies for his analysis. Polat (2011) and Kılavuz et al. (2013) also conducted the same research with selected economies. According to the findings in these studies, Turkey's intra-industry trade has low quality vertical intra-industry trade characteristic. On the other hand, a research made by Özkaya (2010) for the textile sector in Turkey showed that this sector has the horizontal intra-industry trade characteristic since the 1990's. In the limited literature about decomposition of Turkey's intra-industry trade, it can be seen that, there is no specific study that examines the relationship between horizontal, vertical intra-industry trade and foreign direct investment flows by utilizing econometric tools.

DATASET AND METHODOLOGY

The most frequently used index for the measurement of intra-industry trade is developed by Grubel and Lloyd (1971:494-517) According to Grubel and Lloyd (1971:496), intra-industry trade can be calculated by utilizing the following equation:

$$B_i = 1 - \frac{|X_i - M_i|}{X_i + M_i} \quad (1)$$

In the abovementioned equation, (B_i) shows the index result for intra-industry trade, (X) and (M) represents exports and imports with the country in question, (i) indicates products or product groups and (n) stands for number of observations. According to the equation (1), in order to measure intra-industry trade of a product or a certain group of products, the difference of export to the relevant country to imports from the country is taken in absolute value and the result will be divided by the sum of exports and imports of the certain product or product group to/from the country. A value between 0 and 1 is obtained when the result is subtracted from 1. When the Grubel-Lloyd index value is 0, there is pure intra-industry trade and if the index value is 1, there is pure inter-industry trade. Index results can be multiplied by 100 in order to make the results easier to examine.

The share and number of computed products in total foreign trade can differ. In such case, the weighted average will be utilize to calculate a certain group of products (Grubel and Lloyd, 1971:497):

$$B_i = \frac{\sum_{i=1}^{n}(X_i + M_i) \; - \sum_{i=1}^{n}|X_i - M_i|}{\sum_{i=1}^{n}(X_i + M_i)} \quad (2)$$

Following the work of Grubel and Lloyd (1971:494-517), different calculation methods developed for intra industry trade. In this context, the study conducted by Abd-al-Rahman (1991: 83-97) paved the way for decomposing the intra-industry trade as vertical and horizontal. The horizontal and vertical intra-industry trade distinction provides important data for more detailed analysis of intra-industry trade patterns between countries. Abd-al-Rahman (1991: 88) argued that the quality of the products is related to unit prices and one-way trade, thus the trade of horizontal and vertical differentiated products can be classified. The basis of this approach is that the horizontal and vertical differentiated products have different unit prices. Since vertical differentiated products will include different technology uses, unit prices are estimated to be relatively low or high. On the other hand, when there is trade in horizontally differentiated products, similar unit prices will be in question. According to OECD (2005:200), horizontal intra-industry trade includes differentiated products in terms of diversity (e.g. cars of similar class and price range); on the other hand vertical intra-industry trade involves differentiated products in terms of quality and price (e.g. Italy's export of high quality garments and low-quality garment import).

Abd-al-Rahman (1991: 88) suggested that the ratio of export or import flows to each other as a criteria to determine the one-way trade. If the beforementioned ratio is less than 10%, there is one way trade. Nielsen and Lüthje (2002) used different threshold values such as 20% and 30%. So, there is one-way trade between the two countries when there is a significant difference between export and import. By utilizing this criteria, one-way and two-way (intra-industry) trade types can be distinguished. After that, export and import unit values are used to decompose the two-way trade. Export and import unit values are obtained by dividing total value of export and import of the product to different units of measurement such as weight, liters, parts, square meters. Greenaway et al. (1994: 77-100) developed the unit value analysis of Abd-al-Rahman (1991: 83-97) and used it to decompose the Grubel-Lloyd index. Fontagné and Freudenberg (1997) improved these methods, categorized the trade flows and calculated the share of each category in total trade.

By using the equivalents given by Fontagné and Freudenberg (1997), horizontal and vertical intra-industry trade and one-way trade can be calculated. In addition to method developed by Greenaway et al. (1994: 77-100), vertical intra-industry trade can be also decomposed as low and high quality. The distinction of intra-industry trade flows allows the examination of the quality in the two-way trade between the two countries. If the quality of a product exported by a country is lower than the quality of the product it imports, there is low quality vertical intra-industry trade; and if it is higher, then high quality vertical intra-industry trade is present. When the quality of imports and exports of a country is similar, there is horizontal intra-industry trade between two countries.

In our study, one and two-way trade distinction is made by using the equation (4) and then the interval equivalents (5, 6, 7, 8) developed by Fontagné and Freudenberg (1997) are used for the intra-industry trade decomposition in the sub-sectors which are subject to two-way trade:

$$\frac{\text{Min}(X, M)}{\text{Max}(X, M)} > \%10 \qquad (4)$$

$$\text{HIIT} = 1 / 1 + \alpha \leq (\text{UVx} / \text{UVm}) \leq 1 + \alpha \qquad (5)$$

$$\text{LQVIIT} = (\text{UVx} / \text{UVm}) \leq 1 + \alpha \qquad (6)$$

$$\text{HQVIIT} = 1 / 1 + \alpha \leq (\text{UVx} / \text{Uvm}) \qquad (7)$$

$$\text{VIIT} = \text{HQVIIT} + \text{LQVIIT} \qquad (8)$$

UVx: Export Unit Value Index,

UVm: Import Unit Value Index,

IIT: Total Intra-Industry Trade,

HIIT: Horizontal Intra-Industry Trade,

VIIT: Vertical Intra-Industry Trade,

HQVIIT: High Quality Vertical Intra-Industry Trade,

LQVIIT: Low Quality Vertical Intra-Industry Trade,

OWT: One-way Trade,

α: refers to the interval value used in the calculation.

The α value is an important element to determine the interval values to distangle intra-industry trade. It varies according to different studies. The main criteria in the choice of α is the geographical distance between economies. Geographical distance in the trade determines the size of transportation and/or freight expenses. Therefore, in line with the distance between countries, the α value can be set as 0.15 or 0.25. In the selection of these thresholds, transaction costs (Zhang, 2005: 519), statistical differences which arise from aggregation of different products in the trade standardization and the volatility in the exchange rates (Fukao, 2003: 473) can also play a role. However, there is no consensus on the fact that these thresholds should be 0.15 or 0.25. Thus, the choice of thresholds may vary depending on the authors' prediction. Greenaway et al. (1994) and Fontagné and Freudenberg (1997) found that the selection of threshold values as 0.15 or 0.25 did not significantly change the results of the study and there was no very sensitive criterion in this framework.

In our study, it is estimated that the trade and transaction costs would be relatively high due to the geographic distance. Therefore, α value was determined as 0.25 in the calculation of horizontal and vertical intra-industry trade. Turkey's trade data with the EU-28, the World and the non-EU28-World economies for the period 2005-2016 were obtained from the UN-COMTRADE database in SITC rev.3 standardization and aggregated. The results obtained in this framework are given in Table 1 and Table 5, Table 6 in the appendix.

TURKEY'S INTRA-INDUSTRY TRADE DECOMPOSITION FOR 2005-2016 PERIOD

Turkey's intra-industry trade in the period of 2005-2016 with EU28, fluctuated on a small scale during the period, but showed an increase. Total intra-industry trade, which was 40.22 in 2005, increased to 46.87 in 2016. Total intra-industry trade average of the period was realized as 42.74. Turkey's average intra-industry trade with the World and non-EU28 World in the period, is 45.29 and 41.82 respectively

When the distribution of intra-industry trade with EU28 is analyzed, it is seen that one-way trade has the highest share with 40.67% in 2005. One-way trade is followed by products with low quality vertical intra-industry trade (37.42%), horizontal intra-industry trade (19.40%) and high-quality vertical intra-industry trade (2.51%). It can be said that this intra-industry trade structure realized with EU28 in 2005-2016 has changed significantly. As a matter of fact, in 2016 share of one-way trade and horizontal intra-industry trade decreased to 26.23% and 9.88% respectively. On the other hand, the share of low quality vertical intra-industry trade

increased to 57.42%. The share of high-quality vertical products, though not at a significant level, rose to 6.48%.

It is observed that the share of horizontal intra-industry trade has decreased with a fluctuating course and the low-quality vertical intra-industry trade has increased similarly when the change in the distribution of total intra-industry trade with EU28 is analyzed. The share of horizontal intra-industry trade in total intra-industry trade reached its highest level in 2011 with 30.47%. The share of low quality vertical intra-industry trade (33.59%) in the same year is the lowest in the period. The share of one-way trade had a declining trend throughout the period with the exception of increase in 2009 and 2010. After 2005, the share of high quality vertical intra-industry trade started to increase and in 2009 its share became 5.91%. Then, the share of vertical intra-industry trade, which declined until 2013, started to increase at a higher rate.

When Turkey's intra-industry trade distribution with the World is analyzed, it is seen that in 2016, the share of one-way trade is 15.94 percent. The share of high quality vertical intra-industry trade, low quality vertical and horizontal intra-industry trade are 10.51%, 49.38% and 24.17% respectively, in the same year. Compared to the trade realized with EU28, it can be understood that the share of one-way trade is quite low. On the other hand, the share of horizontal intra-industry trade is 145% and the share of high-quality vertical intra-industry trade is 62% higher than that of the EU28. However, the share of low quality vertical intra-industry trade was about 8 percentage points lower than trade with the EU28.

In the literature, having the Grubel-Lloyd index value above 50, is one of the important indicators of intra-industry trade structure for a certain commodity or a commodity group. In Turkey’s trade with EU28 in the period of 2005-2016, average number of products with intra-industry trade is 84. In 2005, there were 77 products in this category, and the highest level was reached in 2007 with 90 products. The number of products followed a fluctuating course during the period. And it decreased to 84 according to calculation for the years of 2015 and 2016.

In Turkey's trade with the World and non-EU28 World in the same period, number of commodities with intra-industry trade are 88 and 91 respectively. Although there are fluctuations during the period, it can be said that there is a trend close to the average. In the intra-industry trade with the World and non-EU28 World in 2015, the number of commodities with a Grubel-Lloyd index value above 50 reached its maximum levels during the period and increased to 96 and 101 respectively. Both average and end-of-period data indicate that intra-industry trade with the World and non-EU28 World is higher compared to intra-industry trade with the EU28, in this context.

Table 1. Turkey's Total Intra-Industry Trade with EU28:2005-2016 Period

	GL Index – Horizontal/Vertical Distinction (x100)					Share of Horizontal/Vertical IIT in the Total Trade (%)				GL Index – Horizontal/Vertical Distinction (Number of Commodities)				
YIL	IIT	HIIT	VIIT		OWT	HIIT	VIIT		OWT	IIT (GL > 50)	HIIT	VIIT		OWT
			HQVIIT	LQVIIT			HQVIIT	LQVIIT				HQVIIT	LQVIIT	
2005	40.22	13.62	1.35	22.12	3.13	19.40	2.51	37.43	40.67	77	27	18	104	104
2006	41.03	13.60	0.80	23.30	3.33	19.98	2.23	40.39	37.40	80	28	20	104	100
2007	41.77	11.06	2.70	24.72	3.29	17.02	4.76	43.74	34.48	90	28	19	105	101
2008	43.13	10.54	2.86	27.19	2.53	15.67	5.62	50.24	28.48	85	28	20	116	87
2009	40.78	12.55	3.41	22.12	2.70	19.96	5.91	42.22	31.91	84	27	22	113	90
2010	41.79	17.23	1.00	20.29	3.28	26.30	2.47	35.58	35.65	83	30	23	98	101
2011	42.58	19.20	0.64	19.46	3.28	30.47	1.81	33.59	34.13	88	44	21	90	97
2012	41.77	14.30	0.96	23.55	2.97	23.39	1.92	42.42	32.27	89	38	21	99	95
2013	43.22	15.85	1.44	23.17	2.77	25.07	3.02	41.41	30.51	84	38	23	98	94
2014	44.33	6.49	4.95	30.13	2.76	13.42	8.22	47.92	30.45	81	31	31	94	96
2015	45.35	6.34	5.09	31.39	2.53	13.16	8.32	50.39	28.13	84	34	30	96	92
2016	46.87	5.18	3.65	35.78	2.25	9.88	6.48	57.42	26.23	84	32	25	101	92

Source: Author's calculation by using export-import data classified as the 3-digit SITC rev.3 standardization extracted from UN-COMTRADE database (https://comtrade.un.org/data/)

When the distribution of Turkey's trade with EU28 is examined, it is found that average for one-way trade is 96, horizontal intra industry trade is 32, low quality vertical intra industry trade is 102, high quality vertical intra industry trade is 23 in terms of number of commodities. The data show that the trend in the period fluctuates close to the average values. Throughout the period, one-way trade decreased with fluctuations. On the other hand, the number of commodities with high quality vertical intra-industry trade increased by 39%. The number of commodities with horizontal and low quality vertical intra-industry trade characteristics has not changed significantly. The distribution of Turkey's intra-industry trade with the World and non-EU28 World shows that Turkey has 81 and 88 commodities with one-way trade, 41 and 48 commodities with horizontal intra-industry trade, 99 and 81 commodities with low quality vertical intra-industry trade, 33 and 38 commodities with high-quality vertical intra-industry trade characteristics, respectively.

Compared to the EU28, the number of commodities with one-way trade is lower, but the number of products with horizontal intra-industry trade characteristic are 29% and 49% higher; also commodities with vertical intra-industry trade characteristic are 46.15% and 66.28% higher, in the Turkey's trade with the World and non-

EU28 World, respectively. The number of products with low quality vertical intra-industry trade characteristic in trade with EU28 is close to the World average. However, in the trade with non-EU28 World, the number of products in this category is 20.44% lower than the average.

The first studies that examine Turkey's intra-industry trade conducted by Küçükahmetoğlu (2001) and Gönel (2001), the following articles in the literature and calculations show that Turkey's trade structure with EU and the World have inter-industry trade characteristics for at least 30 years. When the countries' share in the World economy is examined in the period of 2013-2017, it is observed that Germany has 7.79%, France has 3.68%, UK has 3.47%, Netherlands has 3.22%, Italy has 2.71%, EU28 has 35.24%, whereas Turkey is seen to have a share of 1.01%. In the same period, the share of countries' exports of high technology products is 15.86% in Germany, 25.81% in France, 21.24% in the United Kingdom, 19.20% in the Netherlands, 7.2% in Italy, 2.1% in Turkey. (World Bank, 2019) The average value of high technology products in EU28's exports is 12.8%. The reasons behind Turkey's foreign trade structure that shows inter-industry characteristic can be better understood when Turkey's foreign trade data is compared with the EU countries and EU28 in terms of their share of export in the World economy and the ratio of high technology products in their exports. Trade data, research and empirical findings show that Turkey specialized in labor intensive products with low added value in the global division of labor.

ECONOMETRIC ANALYSIS

Model

In order to analyze the determinants of intra-industry trade between Turkey and EU28, the period of 2005-2016 is examined. The reason behind this period selection is that the data of Foreign Direct Investment of countries in the TCMB database have been available only since 2005. In the panel data analysis, total and decomposed intra-industry trade indices between Turkey and each member state in EU28 were utilized as cross sections and in this context the following regression is formed:

$$IIT_{TOP(IIT,HIIT,VIIT,HQVIIT,LQVIIT,OWT)}=\beta_0 + \beta_1 \ FDI + \beta_2 \ \ln(GDP\_EU) + \beta_3 \ \ln(GDP\_TR) + \beta_4 \ DIST + \beta_5 \ TO + \beta_6 \ \ln(GDPPC\_EU) + \beta_7 \ \ln(GDPPC\_TR) + \varepsilon_{TR}$$

6 sub-models in which total, horizontal, vertical, low and high quality vertical intra-industry trade and one-way trade indices used as dependent variables are formed. As it can be seen in Table 2, net foreign direct investment stock (FDI), EU28 and Turkey's GDP (GDP_TR, GDP_EU), EU28 and Turkey's per capita GDP (GDPPC_TR, GDPPC_EU), the commercial proximity (DIST) and trade openness (TO) were used as independent variables in these models.

Table 2. Information of Variables Used in the Econometric Model

Dependent Variable	Abbreviation	Dependent / Independent	Proxy Variable	Expected Co-efficient Sign	Data Source
Total Intra-Industry Trade	IIT	Dependent	Itself	X	Own Calculation
Low Quality Vertical Intra-Industry Trade	LQVIIT	Dependent	Itself	X	Own Calculation
High Quality Vertical Intra-Industry Trade	HQVIIT	Dependent	Itself	X	Own Calculation
Vertical Intra-Industry Trade	VIIT	Dependent	Itself	X	Own Calculation
Horizontal Intra-Industry Trade	HIIT	Dependent	Itself	X	Own Calculation
One-Way Trade	OWT	Dependent	Itself	X	Own Calculation
Market Size	GDP_EU, GDP_TR	Independent	EU28 and Turkey's GDP	+	Eurostat
Level of Economic Development	GDPPC_EU, GDPPC_TR	Independent	EU28 and Turkey's GDP per capita	+	Eurostat
Commerical Proximity	DIST	Independent	Weighted Trade Average of Geographical Proximity	+	Eurostat
Trade Openness	TO	Independent	Trade (X+M) / GDP	+	Eurostat
Foreign Direct Investment	FDI	Independent	Net Foreign Direct Investment Stock	+	TCMB (EVDS) Database

Hausman test was applied to determine the regression estimators in panel data analysis. According to the test results in Table 3, in HQIIT, LQVIIT, HIIT, VIIT sub models random effects estimators and in IIT and OWT sub-models fixed effects estimators were used.

Table 3. Hausman Test Results

Model	Hausman Test Result	Estimator
IIT	0.0572	Fixed Effects
HQVIIT	0.2808	Random Effects
LQVIIT	0.6449	Random Effects
HIIT	0.2889	Random Effects
OWT	0.0111	Fixed Effects
VIIT	0.6869	Random Effects

Theoretical Framework and Findings

In the econometric models, the relationship between Turkey's total, horizontal, vertical (low and high quality) intra industry trade, one-way trade and market size, level of economic development, commerical proximity, trade openness, foreign direct investment variables are examined.

Table 4. Estimates of Turkey's One-Way and Intra-Industry Trade Types with EU28

Model	(a)	(b)	(c)	(d)	(e)	(f)
Variables	IIT	HQVIIT	LQVIIT	HIIT	OWT	VIIT
FDI	-9.78e-13	1.14e-12**	-3.03e-12*	-1.26e-12	2.88e-13	-1.97e-12
	(2.12e-12)	(5.09e-13)	(1.71e-12)	(1.41e-12)	(4.24e-13)	(1.75e-12)
GDP_EU	-0.203*	0.00729***	0.0523***	0.0234***	-0.0146	0.0598***
	(0.107)	(0.00227)	(0.00801)	(0.00701)	(0.0215)	(0.00832)
GDP_TR	0.440**	0.117**	0.0823	0.294*	-0.0441	0.201
	(0.188)	(0.0568)	(0.188)	(0.151)	(0.0378)	(0.191)
DIST	0.0111***	-0.000406	0.00785*	0.00596*	-0.00190**	0.00744*
	(0.00404)	(0.00122)	(0.00405)	(0.00326)	(0.000809)	(0.00413)
TO	0.000136	9.68e-05**	0.000462***	0.000279**	-0.000163***	0.000564***
	(0.000226)	(4.17e-05)	(0.000145)	(0.000124)	(4.53e-05)	(0.000150)
GDPPC_EU	0.280***	-0.0173***	-0.0413***	-0.0312**	0.0117	-0.0586***
	(0.106)	(0.00439)	(0.0155)	(0.0137)	(0.0213)	(0.0162)
GDPPC_TR	-0.542**	-0.172**	-0.0290	-0.438**	0.0706	-0.203
	(0.260)	(0.0782)	(0.259)	(0.208)	(0.0521)	(0.264)
Constant	-5.209	-1.585*	-3.465	-4.689**	0.996	-5.082*
	(3.270)	(0.845)	(2.797)	(2.254)	(0.655)	(2.851)
Observations	324	324	324	324	324	324
R-squared	0.4914	0.2162	0.4612	0.2050	0.0909	0.4964
No. of pid	27	27	27	27	27	27

Note: Standart errors in parentheses.

(***), (**) and (*) denote %1, %5 and %10 significance level, respectively.

Market Size: As the average market shares of countries increase, intra-industry trade is expected to improve. In larger markets, many differentiated commodities are produced within the framework of economies of scale. With increasing market size, intra-industry trade improves as demand for differentiated products increases. (Loertscher and Wolter, 1980: 283; Balassa, 1986b: 29; Somma, 1994: 792; Clark and Stanley, 2003: 5) Factor endowment of countries and economies of scale play a key role in product differentiation and consumer preference (Hurley, 2003: 5). Lancaster (1980: 151-175) showed that countries can produce more differentiated products and have greater access to larger economies of scale by specializing in niche sectors.

In Turkey's total trade with EU28, it is seen that increase in GDP doesn't affect one-way trade; but affects high quality vertical and horizontal intra-industry trade positively. In the total intra-industry trade, the increase in the EU28's GDP has a negative affect; a positive change in Turkey's GDP has a positive effect. Although, an increase in Turkey's GDP doesn't have any statistically significant effect on vertical and low quality vertical intra-industry trade, it can be observed that an increase in EU28's GDP triggers a positive effect on them.

Coefficients of the both independent variables are in line with our expectations, except the negative relationship between Turkey's GDP and total intra-industry trade.

Level of Economic Development: Linder (1961: 82-109) states that a high level of economic development will lead to emergence of more differentiated products in international trade. Considering Linder's hypothesis, it can be concluded that intra-industry trade has a positive relationship with the level of economic development. (Balassa, 1986b: 28) The demand in countries with low per capita income is generally concentrated in standardized products; on the other hand countries with high per capita income will have more demand for differentiated products (Hellvin, 1996: 23). Falvey (1981: 495-511) and Flam and Helpman (1987: 810-822) have introduced models that elaborate the trade of vertical differentiated products between different per capita income countries.

Empirical findings show that there is a negative relationship between Turkey's high quality vertical and horizontal intra-industry trade with EU28 and GDP per capita. Although there are no statistical effects arising from Turkey's per capita GDP value; EU28's GDP per capita has a negative relationship in vertical and low quality vertical intra-industry trade. In one-way trade, changes in per capita GDP have no statistically significant effect. The increase in EU28's GDP per capita affects Turkey's total intra-industry trade positively, while the rise in Turkey's GDP per capita affects it negatively. In the model, it was found that the coefficients of the two independent variables (EU28 and Turkey's GDP per capita) were not in line with our expectations, except that the positive relationship between EU28's GDP per capita and total intra-industry trade.

Commercial Proximity: Transaction costs can have a significant impact on the level of product differentiation. (Loertscher and Wolter, 1980: 285) In fact, in the intra-industry trade models, trade costs, which are among the most important items of transaction costs, will decrease the trade volume. Intra-industry trade is not only affected by the geographical proximity of the markets; but the similarities of the cultural and market structure as well. (Somma, 1994: 793) The distance between trade partners can reflect not only transportation costs but also relative social and cultural costs. (Thorpe and Leitão, 2013: 241-242)

Crespo and Fontoura (2004: 65) state that economic distance is more successful in representing transaction costs. They also state that there is no linear increase between trade costs and distance. As a matter of fact, information and transportation costs may not have a fixed relationship with geographical distance. (Lee and Lee, 1993: 165) Because, the higher volume of trade can cause a decreasing effect on the average costs. For this reason, using the following formula, trade weighted proximity values are calculated for each year:

$$Commerical\ Proximity = \frac{\sum\left(\frac{X_i + M_i}{\sum(X_i + M_i)}\ x\ D_i\right)}{N_i} \quad (9)$$

(i) shows the country, (N) number of countries, (X) export and (M) import values in dollars and (D) represents the distance between the capitals of the two countries in km. EU Commission Distance Calculator (2018) was used for the calculation of the distance between the capitals as air distance.

Findings show that commercial proximity has no statistically significant effect on Turkey's high quality vertical intra-industry trade with EU28. On the other hand, total, vertical, low quality vertical and horizontal intra-industry trade are positively affected by the increase in commercial proximity; and also there is a negative effect in one-way trade. The results of the analysis in the model meet our expectations, except for one-way trade. Since the ratio of trade to distance is used as a representative variable, the effect of the costs that may arise from the geographical distance is balanced if the trade volume is too high. Stone and Lee (1995: 79) concluded that there is a positive relationship between intra-industry trade and geographical distance in the countries they analyzed. This situation was justified by the Authors as the higher trade volume of countries with high intra-industry trade indices having trade with remote countries. In such case, greater geographical proximity with high trade volume may result false notion in terms of better intra-industry trade indices with remote countries. Similar situation is considered to be valid in one-way trade between Turkey and the EU28.

Trade Openness: According to Loertscher and Wolter (1980: 283-284), the intra-industry trade is expected to increase when trade barriers between the countries are reduced. Falvey (1981: 505) found that there was an inverse relationship between the high level of tariffs, trade restrictions and trade volume in the model that involves constant returns to scale and a limited amount of capital. The lifting of trade barriers or trade liberalization policies will have an increasing impact on intra-industry trade. (Clark and Stanley, 1999: 84; Clark and Stanley, 2003: 5). Balassa (1986b: 29) states that it is unclear whether tariffs will affect intra-industry trade more than inter-industry trade.

While the trade openness has a positive effect on vertical, low and high quality vertical and horizontal intra-industry trade; on the one-way trade there is a negative effect. The trade openness has no statistically significant effect on the total intra-industry trade. On the other hand, the effect of increase in trade openness on intra-industry trade is in line with our expectations in the hypothesis.

Foreign Direct Investments: Pittiglio and Reganati (2005: 33) argue that there is no consensus in the literature on how foreign direct investments will affect intra-industry trade. Foreign direct investment may serve as a substitute for imports if it aims to seek new markets. (Zhang et al., 2005: 515) Such investments are generally carried out in order to avoid tariffs and non-tariff barriers, to benefit from the brand recognition in the invested country and to utilize the infrastructure of transportation and communication networks. Compared to foreign direct investment that aims increasing efficiency, it can be argued that the contribution of market seeking FDI to the invested country can be considered as minimum. Depending on the type of foreign direct investments, the relationship with horizontal intra-industry trade may occur in both directions. While foreign direct investment with the purpose of looking for new markets replaces the trade and has a negative impact; foreign direct investment for productivity purposes leads to an increase in trade. (Türkcan and Ateş, 2010: 24-25)

Multinational firms can realize their production processes in different countries by considering factor equipment and costs. In a two-country model, it can be observed that the intra-industry trade will be increased as the commodities produced as a result of the fragmented production process will return to the re-investing country. On the other hand, fragmentation does not always have an increasing effect on intra-industry trade. More complex trade flows can arise when it comes to one-way trade or trade with more than one country. In addition, multinational companies can realize their fragmented production not only using foreign direct investments, but subcontractors and / or local firms as well. (Yoshida et al., 2009: 352) The effect of foreign direct investments resulting from fragmented production processes on intra-industry trade can be quite complicated when more than two countries are involved. The intra-industry trade relationship may become unclear in the complex FDI models asserted by Yeaple (2003: 293-314) and the export platform model (Motta and Norman, 1996: 757-783; Ekholm et al., 2007: 776-795; Yoshida et al., 2009: 364)

In Turkey's total, vertical intra industry trade and one-way trade with EU28, it is seen that foreign direct investment has no statistically significant effect. On the other hand, effects of FDI on high quality vertical intra-industry trade is positive; on low quality vertical intra-industry trade is negative. Except high quality vertical intra-industry trade, co-efficient signs of the foreign direct investment flows are not in line with our expectations in the hypothesis.

CONCLUSION

Although the share of intra-industry trade in Turkey’s trade with EU28, the World, non-EU28 World increased in 2005-2016 period, it can be seen that there is still an inter-industry trade pattern. When Turkey’s the structure of intra-industry trade with these three economies is analyzed, it is observed that one-way trade and horizontal intra-industry trade decreased whilst low-quality vertical intra-industry trade increased. The share of high quality vertical intra-industry trade also improved slightly during the period. It can be asserted that there is a transition from a one-way trade-intensive structure to a trade structure where low-quality vertical intra-industry trade is gradually gaining importance.

When Turkey’s total intra-industry trade in 2005-2016 period with EU28 is compared with the World and non-EU28 World, share of one-way trade and low quality vertical intra-industry trade is at higher and high quality vertical and horizontal intra-industry trade is at lower levels. By utilizing unit value analysis to decompose the intra-industry trade, it can be stated that product quality in Turkey’s intra-industry trade with the World and non-EU28 world is higher than the one with EU28.

In the econometric models developed by using the country level determinants of Turkey’s intra-industry trade with EU28, it is found that there is a positive relationship between intra-industry trade and market size, commercial proximity, trade openness; and there is a negative relationship with level of economic development. Foreign direct investment affects low quality vertical intra-industry trade negatively and high

quality vertical intra-industry trade positively. There is no statistically significant effect on other intra-industry trade sub-models.

Given the theoretical models, it can be deduced that foreign direct investments made into the industries with high quality vertical intra-industry trade has the motive of productivity increase. On the other hand, a negative and statistically significant relationship was found between low quality vertical intra-industry trade and foreign direct investments. In this context, it can be stated that foreign direct investments, which come to the sectors with low quality vertical intra-industry trade pattern, are intended for market-seeking purposes.

In terms of the fragmentation theory, it can be said that there is an uncertain situation for Turkey. In the model of low and high quality vertical intra-industry trade, the coefficients of FDI variable are opposite to each other. Also, the effect of foreign direct investment on total vertical intra-industry trade is statistically insignificant. According to the fragmentation theory, there is a positive relationship between foreign direct investment and vertical intra-industry trade. In this context, our results regarding the impact of foreign direct investment on high quality vertical intra-industry trade is compatible with this theoretical model. However, this finding to prove the presence of production structure asserted in the fragmentation theory, may considered to be insufficient. This also applies to sectors in sub-models that have statistically insignificant or negative relationship with foreign direct investment. Because firms in global value chain and/or companies with fragmented production processes may also choose to collaborate with sub-contractors and local firms rather than making direct investments. Therefore, having a positive relationship between foreign direct investment and intra-industry trade can be only evaluated as an indicator for such production model.

DOĞRUDAN YABANCI SERMAYE YATIRIMLARININ TÜRKİYE-AB28 ENDÜSTRİ İÇİ TİCARETİNE ETKİSİ

ÖZ

Çalışmanın amacı, 2005-2016 döneminde Türkiye ve AB28 arasındaki toplam, yatay ve dikey endüstri içi ticaretin dağılımı, gelişimi ve belirleyicilerinin incelenmesi ve doğrudan yabancı sermaye yatırımlarının etkisinin değerlendirilmesidir. Türkiye'nin ticaretinde, endüstri içi ticaretin payı artış gösterse de; endüstriler arası ticaret yapısının varlığı söz konusudur. Bulgular, dönem içinde, tek yönlü ticaret yoğunluklu bir yapıdan, dikey düşük kalite endüstri içi ticaretin ağırlık kazandığı bir ticaret yapısına geçişin olduğunu göstermektedir. Türkiye'nin AB28'le toplam endüstri içi ticareti, tüm dünya ve AB28 harici diğer dünya ülkeleriyle kıyaslandığında, tek yönlü ticaret ve dikey düşük kalite endüstri içi ticaretin daha yüksek; dikey yüksek kalite ve yatay endüstri içi ticaretin daha düşük düzeylerde olduğu görülmektedir. Modelde, genel olarak, endüstri içi ticaretin piyasa büyüklüğü, ticari yakınlık ve açıklıkla pozitif; gelir düzeyi farklılıkları ile negatif ilişki içerisinde olduğu tespit edilmiştir. Doğrudan yabancı sermaye yatırımları, dikey düşük kalite endüstri ticareti negatif; dikey yüksek kalite endüstri içi ticareti pozitif yönde etkilemektedir; diğer endüstri içi ticaret modellerinde ise istatistiki açıdan anlamlı etkisi bulunmamaktadır.

Anahtar Kelimeler: Endüstri içi ticaret, dikey endüstri içi ticaret, yatay endüstri içi ticaret, panel veri analizi.

APPENDIX

Table 5. Turkey's Total Intra-Industry Trade with the World:2005-2016 Period

	GL Index – Horizontal/Vertical Distinction (x100)					Share of Horizontal/Vertical IIT in the Total Trade (%)				GL Index –Horizontal/Vertical Distinction (Number of Commodities)				
YIL	IIT	HIIT	VIIT		OWT	HIIT	VIIT		OWT	IIT (GL > 50)	HIIT	VIIT		OWT
			HQVIIT	LQVIIT			HQVIIT	LQVIIT				HQVIIT	LQVIIT	
2005	40.28	15.24	4.10	18.12	2.81	23.00	6.08	34.94	35.99	84	39	22	99	95
2006	40.30	13.72	3.51	20.69	2.38	24.04	6.15	40.64	29.16	78	37	25	102	91
2007	41.15	16.96	3.04	18.73	2.41	29.48	4.95	37.34	28.23	82	36	29	100	90
2008	45.38	20.41	3.66	19.44	1.87	33.11	7.37	39.61	19.92	84	39	32	101	82
2009	44.48	17.53	4.81	20.57	1.57	31.11	8.53	42.38	17.97	86	41	33	104	77
2010	46.26	21.01	4.09	18.98	2.17	35.37	6.61	36.27	21.75	85	43	38	97	76
2011	46.18	17.80	6.06	20.39	1.92	30.48	10.18	38.87	20.47	95	40	36	97	82
2012	48.33	20.94	6.01	19.62	1.75	32.39	11.91	37.78	17.93	94	42	39	99	74
2013	46.54	18.31	5.95	20.40	1.89	32.12	11.85	37.09	18.94	87	45	36	92	82
2014	47.39	12.82	5.78	26.94	1.85	23.22	11.81	46.47	18.50	92	41	39	97	77
2015	48.01	12.74	6.35	27.45	1.47	22.18	13.30	47.72	16.81	96	43	35	103	73
2016	49.20	14.53	4.96	28.44	1.27	24.17	10.51	49.38	15.94	88	48	35	99	71

Source: Author's calculation by using export-import data classified as the 3-digit SITC rev.3 standardization extracted from UN-COMTRADE database (https://comtrade.un.org/data/)

Table 6. Turkey's Total Intra-Industry Trade with non-EU28 World:2005-2016 Period

	GL Index – Horizontal/Vertical Distinction (x100)					Share of Horizontal/Vertical IIT in the Total Trade (%)				GL Index –Horizontal/Vertical Distinction (Number of Commodities)				
YIL	IIT	HIIT	VIIT		OWT	HIIT	VIIT		OWT	IIT (GL > 50)	HIIT	VIIT		OWT
			HQVIIT	LQVIIT			HQVIIT	LQVIIT				HQVIIT	LQVIIT	
2005	34.80	13.90	6.14	12.22	2.53	24.45	11.59	20.92	43.04	82	42	37	78	98
2006	34.94	14.05	6.22	12.76	1.91	28.92	13.11	21.27	36.70	82	42	37	81	95
2007	36.83	17.48	4.69	12.60	2.05	32.17	8.97	22.56	36.29	86	54	35	75	91
2008	43.89	22.52	6.13	13.20	2.03	35.09	12.64	22.69	29.58	89	51	40	74	89
2009	42.90	18.12	5.43	17.33	2.02	33.35	9.18	29.58	27.88	92	43	39	87	86
2010	43.43	17.85	5.56	17.78	2.24	31.36	10.21	29.58	28.85	87	42	40	86	86
2011	42.69	16.17	6.16	17.83	2.52	26.85	12.02	30.69	30.43	90	44	39	79	93
2012	45.81	22.01	5.98	15.73	2.08	35.25	12.58	26.29	25.88	93	55	34	78	87
2013	42.40	17.07	5.93	17.02	2.38	34.73	11.00	27.00	27.27	98	54	33	83	85
2014	43.94	17.86	5.92	17.67	2.49	31.69	12.09	28.38	27.84	96	57	36	75	86
2015	44.23	16.80	5.83	19.42	2.19	28.89	12.22	31.37	27.52	101	47	38	85	84
2016	45.96	17.80	6.39	19.95	1.82	26.69	14.78	34.08	24.45	94	43	46	88	76

Source: Author's calculation by using export-import data classified as the 3-digit SITC rev.3 standardization extracted from UN-COMTRADE database (https://comtrade.un.org/data/)

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