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The evaluation of the EU trade with Russia based on the analysis of selected indices: Revealed comparative advantages, intra-industry trade and trade intensity

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Abstract:

There have been many geopolitical changes and economic factors that affected the mutual trade between the EU and its main trading partners between the years 2005 and 2016. In the long term, one of the most important trade partners of the EU is Russia. It is a major supplier of energy resources to the EU as well as significant export market for European producers. Even today, when mutual trade relations are negatively influenced by trade-political sanctions, the mutual dependence is undeniable. The submission evaluates the mutual trade between the EU and Russia with the use of selected indices - revealed comparative advantages, intra-industry trade and trade intensity. The analysis of these indicators points to strategic importance of this trade relation. However, if the EU wants to sustain this relation, it should consider how to solve the current tension and after that to strengthen future mutual relations.

JEL Classifications: F10, F14, F15

Keywords: Revealed comparative advantage, trade, Russia, EU

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1. Introduction

At the present time, the development of international economic relations is a result of long-term impact of several factors causing global changes. Many of increasing challenges and tensions have developed in recent years. They are ensuing from the globalization trends and have had a major impact on the development of the world's economy. These include an increasing tension in the Korean Peninsula, disputes about the South China Sea, warfare in Eastern Europe, environmental problems, terrorism and the rise of extremism in several countries of Europe.

Tightly linked economies operating in a globalized world can be badly influenced by these problems; and each negative impulse can be reflected in the statistical indicators of the international trade. This can be also observed in the EU's foreign trade with its major trading partners, including Russia (Grinberg, 2010).

The objective of this paper is to look into the current development of foreign trade between the EU and Russia based on an analysis of selected indices (including revealed comparative advantages, intra-industry trade and trade intensity) and the possibility of further mutual development of foreign trade relations as a result of globalization changes taking place in the world economy.

The paper is organized as follows. At the beginning of Section 2 there is a literature review and then we explain a methodological approach. Section 3 provides results. In the Section 4 we summarize our conclusions and define some recommendation.

2. Literature review and methodological approach

The current development of Russia, according to Bogomolov (Bogomolov, 2010), should preferably evolve in line with the principles of the market economy and not conserve the so called democratic facade hiding the authoritarian regime. The strategies for the modernization of the Russian economy and their successful implementation should improve the long-term position and impact of Russia, not only on world markets, but also on the interstate political scene (Šikula, 2010). Only after a couple of years it will be possible to assess whether the Russian economy has succeeded in transforming the economic model, dependent on exporting the raw materials, into a model of modernization of Russia by current administration. This modernization model is referred to as an "economy of innovation". Importantly, it will be necessary to evaluate the role that the country's energy sector will play in this transition (Kučera, 2010).

With focus on the quality of the EU-Russia foreign trade relations in the energy sector, the EU does not see the risk of its energy dependence as life-threatening, even though it is aware of its importance. However, Russia is not the only source from which the EU acquires its strategic raw materials, such as natural gas and oil. EU and Russia are traditional trading partners, and trade interdependence is not only due to the energy dependency of EU countries from Russia (Drieniková & Zubařová, 2013). The intensity of the EU's political partnership with the Russia is also an important part of the relationship, which is currently affected by sanctions. The success of Russia's economic relations with the Asian and OPEC countries can also have a significant impact (Baláž & Zabojník, 2010). The fact that some countries are heavily dependent on Russian supplies of energy raw materials brings with it the point that Russia is also dependent on its customers, especially from the EU, as well as on transit countries such as Ukraine, Belarus and Slovakia. Therefore, Russia seeks to diversify its export markets to China and Japan. The US is not excluded in the future in order to diversify the transit routes by building new gas pipelines and pipelines to new or old customers (Gonda, 2013).

To streamline the data of foreign trade, the special methods were used including mainly statistical, descriptive analysis, comparison and graphical displays. Empirical methods, especially revealed comparative advantages, were also used. Comparative advantage theory is one of the oldest and most important methods used in international trade. Revealed comparative advantage (RCA) was originally used by Liesner (1958). The expression of comparative advantage was used in the Balassa index which shows the comparative advantages of the economy. According to this analysis, the individual economies specialize in the manufacturing of those products where sufficient comparative advantages are reached and these products are placed on foreign markets through international trade (Balassa, 1965).

The theory of comparative advantages was first developed and published by David Ricardo in 1817. The philosopher and economist John Stuart Mill further developed this area in the middle of the 19th century in the theory of reciprocal demand. After that Alfred Marshall applied the factors of demand and supply in the form of their reciprocal curves. Over time, neoclassical theories or models follow and extend these classical models of foreign trade. Mainly Heckscher-Ohlin-Samuelson (H-O-S) model of comparative advantage enriched with factors of production (20s of the 20th century) and the theorems following (Baláž e. a., 2010).

There are several ways to identify revealed comparative advantage. One of them is the Balassa index RCA which is defined as the ratio of the difference between the export and import of commodity groups and the sum of exports and imports of these commodity

groups. This reflects a comparative advantage in exports and thus its competitiveness. (Balassa, 1965) This method is frequently used and reported in the literature.

$$RCA_1 = \frac{(x_{ij} - m_{ij})}{(x_{ij} + m_{ij})} \quad (1)$$

Where x_{ij} stands for export of country j in commodity group i and m_{ij} import of country j in commodity group i .

If there is no export ($x_{ij} = 0$), then RCA_1 equals -1. If the RCA_1 is more than -1 and less than 0, it indicates to comparative disadvantage. If RCA_1 equals 0, it indicates the same export and import. The range between 0 and 1 denotes revealed comparative advantages. When RCA_1 equals 1, it indicates there is no import (Greenaway & Milner, 1993).

The second expression is the revealed comparative advantage logarithm of the share of exports and imports of goods categories of the countries in total exports and imports of the same country, which we will evaluate in this paper.

$$RCA_2 = \ln \frac{x_{ij}}{m_{ij}} / \frac{X_j}{M_j} \quad (2)$$

Where X_j stands for the value of total exports of country j ; and M_j - the value of total imports into the country j .

If RCA_2 is more than 0, it suggests that in the country there exists revealed comparative advantage for exports of the commodity group; and if it is less than 0, it induces revealed comparative disadvantage in the commodity group.

For more detailed identification of the revealed comparative advantage (Hinloopen & Merrewijk, 2001), possible values of the index can be classified into four categories determining its size, respectively intensity:

1. $0 < RCA \leq 1$ no comparative advantage,
2. $1 < RCA \leq 2$ weak comparative advantage,
3. $2 < RCA \leq 4$ moderate comparative advantage,
4. $4 < RCA$ strong comparative advantage

The second index we will use is the Grubel Lloyd index. In 1971 and in 1975, Grubel and Lloyd published the first book on intra-industry trade (IIT) that pioneered a generation of research on IIT's empirical, theoretical and policy implications. Grubel and Lloyd were the first who analysed potential anomaly that a high proportion of the country's trade consists of internal and external trade in the same group of products. Since that time, based on this index, it was possible to express the current import and export of similar products in selected countries. This business which is defined as intra-industry trade GL index refers to products that are similar or slightly different, and can be explained in different ways (Grubel & Lloyd, 1975).

The GL index measures intra-industry trade as a percentage of a country's trade under the assumption that trade was balanced, implying that exports and imports are equal. The index of intra-industry trade is defined:

$$GLI = [(X_j + M_j) - (X_j - M_j)] / (X_j + M_j) \quad (3)$$

Where X_j stands for export of commodity j ; and M_j - for import of commodity j .

The index's range is from 0 to 1; but when $GLI = 0$, the country is a net importer or exporter where there is no intra-industry trade. This means that the country takes in consideration either only exports or only imports of good i . If $GLI = 1$, it means that there exists intra-industry trade between countries, i.e. that the country takes in consideration exports of goods as much as imports.

The index values are expressed between 0 and 1. A higher index value identifies a higher level of specialization in intra-industry exchange, whereas, a lower value of GL index indicates that the foreign trade is closer to the inter-industry trade (Egger, Greenaway, & Egger, 2005).

The last index we will work with will be the trade intensity index. This is used to determine whether the value of trade between two countries is greater or smaller than would be expected on the basis of their importance in the world trade. It is defined as the share of one country's exports going to a partner divided by the share of world exports going to the partner. It is calculated as (WTO, 2017):

$$T_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt}) \quad (4)$$

Where x_{ij} is export of country i to partner country j ; X_{it} is the total exports of country i ; x_{wj} is the value of world exports to the country j ; and X_{wt} - total world exports.

Data for our research are from statistics of the United Nations Conference on Trade and Development (UNCTADSTAT), UN Comtrade Database (Standard International Trade Classification (SITC) Rev. 3) and EUROSTAT.

3. Results

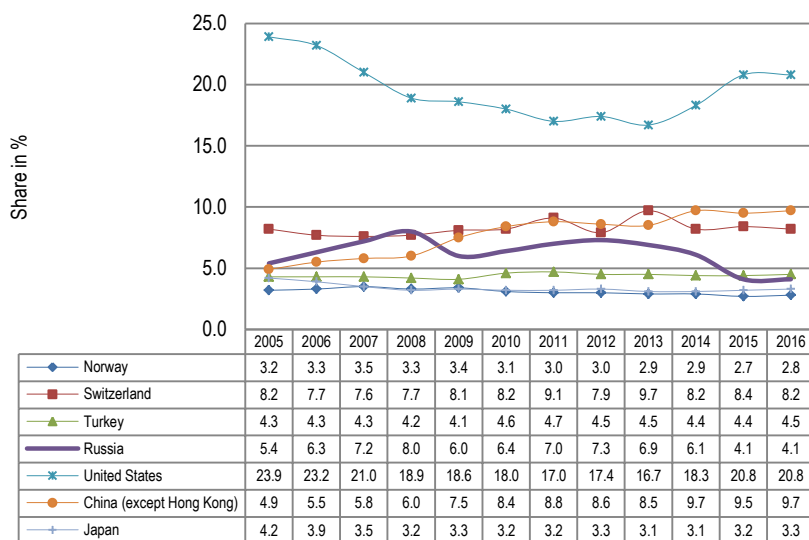
Many geopolitical changes and economic factors such as security issues or global financial crisis have affected the mutual trade between EU and main trading partners in the years 2005 - 2016 (Cerny & Prichard, 2017). After recording a significant and almost continuous fall until 2011, the share of the United States in EU total trade in goods has begun to increase again reaching 17.7% in 2016. The share of China has almost tripled since 2000, rising from 5.5% to 14.9% in 2016. Since 2013 the share of Russia in total EU trade in goods has nearly halved to 5.5% in 2016, as has done the share of Japan since 2000 to 3.6% in 2016. As for Switzerland and Turkey, their shares have remained relatively unchanged over the entire time period.

In 2016, the United States (€610 bn, or 17.7% of total EU trade in goods) and China (€515 bn, or 14.9%) continued to be the two main goods trading partners of the European Union (EU), well ahead of Switzerland (€264 bn, or 7.6%), Russia (€191 bn, or 5.5%), Turkey (€145 bn, or 4.2%) and Japan (€125 bn, or 3.6%).

Figure 1 and Figure 2 show share of EU top trading partners on export and import in years 2005 to 2016. The figures prove declining position of Russia as the trading partner of the EU. In 2016, Russia was only fifth biggest export partner with 4.1 per cent on the total EU export. It was fourth biggest import partner for the EU with 7.0 per cent on the

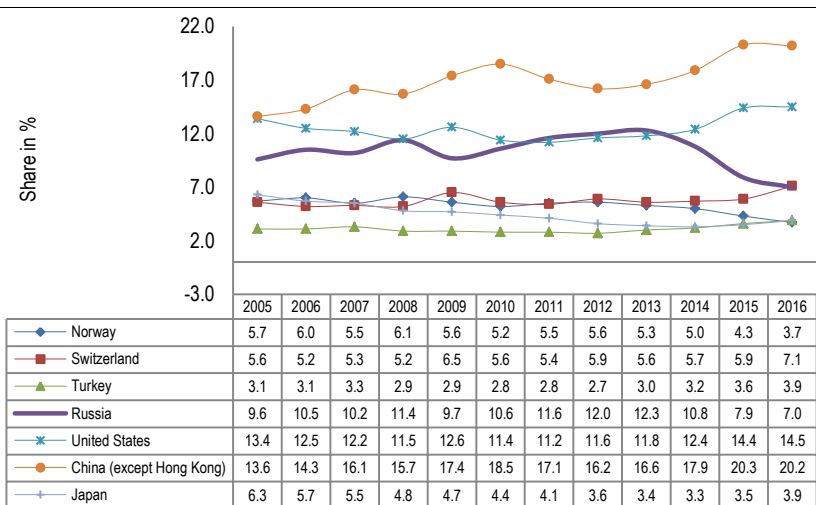
total EU import. In 2005, Russia was the EU's third biggest importer and also third biggest export partner.

FIGURE 1. SHARE OF BIGGEST TRADING PARTNERS ON EXPORT OF EU
IN THE YEARS 2005 - 2016



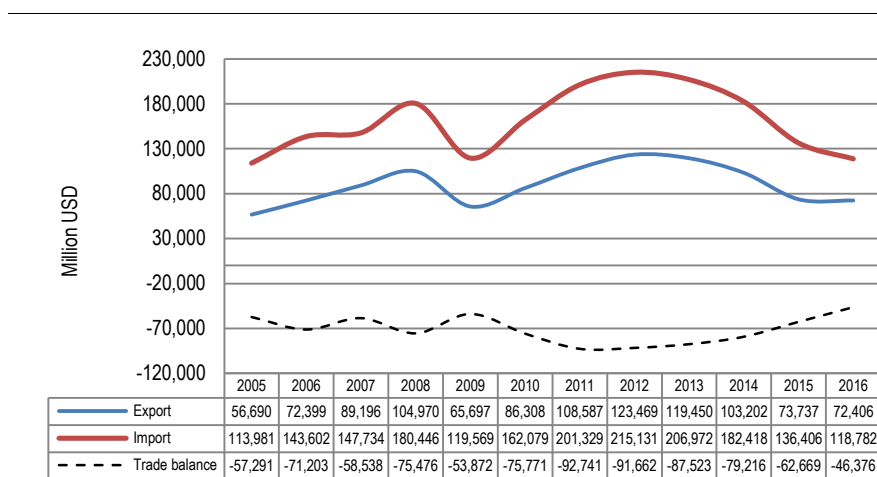
Source: Data from EUROSTAT (2017).

FIGURE 2. SHARE OF BIGGEST TRADING PARTNERS ON IMPORT TO EU
IN THE YEARS 2005 - 2016



Source: Data from EUROSTAT (2017).

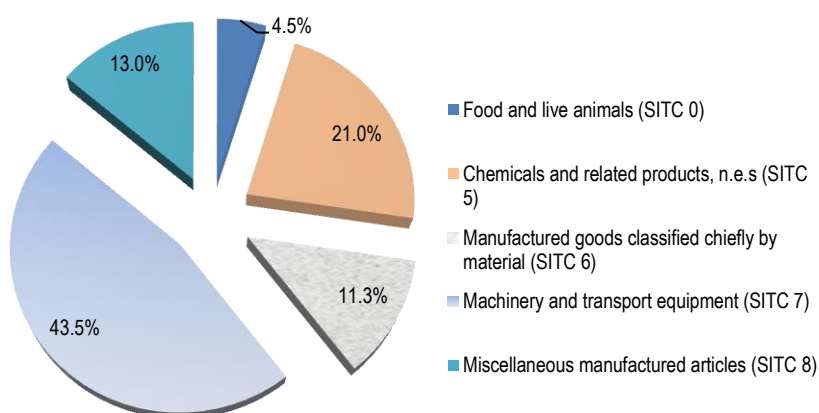
FIGURE 3. TRADE BALANCE EU - RUSSIA IN THE YEARS 2005-2016



Source: Data from EUROSTAT (2017).

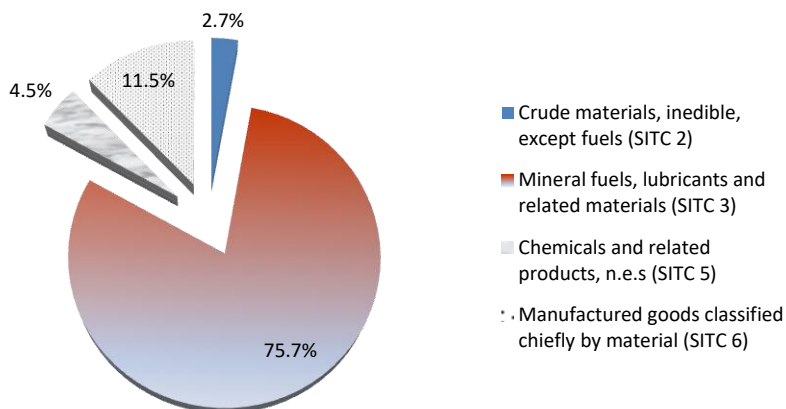
Figure 3 shows the trade balance between the EU and Russia in years 2005-2016. We can see fluctuation in mutual trade. There was enormous decline in both export and import in 2009 due to global financial and economic crisis. The decrease in export and import was about 30%. Nowadays the trade is affected by mutual economic sanctions and declining of prices of oil and natural gas (Bouwmeester & Oosterhaven, 2017). Trade balance between the EU and Russia was passive all the time in the years 2005-2016. EU members have to import oil and natural gas and it will not change in the near future. In 2016 was the passive trade balance 46.365 billion EUR. Decreasing of the passive trade balance between the EU and Russia was mainly due to low prices of oil and natural gas in 2016.

FIGURE 4. THE EXPORT OF MAIN PRODUCTS OF EU TO RUSSIA BY SITC IN 2015



Source: Own calculations.

FIGURE 5. THE IMPORT OF MAIN PRODUCTS OF EU FROM RUSSIA BY SITC IN 2015



Source: Own calculations.

The export structure of Russia to the EU has remained unchanged over the last 10 years. The most tradable products are energy raw materials, such as oil and natural gas, metals, logs and chemical products. The decline of trade in oil and gas with the EU has pressured Russia to find new customers in China and APEC countries (Aalto & Forsberg, 2016).

Figure 4 and Figure 5 show the commodity structure of export and import of the EU and Russia by SITC main products in 2015. The biggest share of export of the EU to Russia has the SITC group 7 with 43.5%. After SITC group 7 follows SITC group 5 with 21%, SITC group 0 with 13% and SITC group 6 with 11.3%. The EU imports from Russia mainly the products in SITC group 3 with share 75.7% on total import. The export of the EU to Russia is more diversified and the exported products have a higher added value than the imports from Russia to the EU.

The geopolitical and economic factors also caused changes in revealed comparative advantages. We have used logarithmic formula to calculate the values of revealed comparative advantages of foreign trade of the EU and Russia. The results revealed comparative advantage of the EU in some groups of products and how strong this advantage is. The revealed comparative advantage in various groups of products (classified by SITC Rev. 3) can be observed in Table 1.

The results show that there is strong asymmetry in foreign trade between EU and Russia. It is caused by the specialization of the EU's exporters in products with high added value in comparison to exporters from Russia. As the Table 1 shows, the EU has almost in all groups revealed comparative advantage in mutual trade with Russia. The exemptions are groups two and three (crude materials and mineral fuels). There were some negative changes for the EU in the year 2014 and 2015. These changes were in the following SITC groups: group 0 - Food and live animals; group 1 - "Beverages and tobacco"; group 4 - "Animal and vegetable oils, fats and waxes"; and group 6 - "Manufactured goods classified chiefly by material". Small changes were in the SITC group 5 - "Chemical products" and SITC group 7 - "Machinery and transport equipment". The EU has the revealed comparative advantage in these groups of commodities, but the results show that the intensity of these advantages is decreasing. On the other hand, we can see that the EU has

moderate comparative advantage in SITC groups 7 and 8. In the group 7 there are products with high added value and this is good signal for the structure of export of the EU to Russia.

TABLE 1. RCA2 - EU - RUSSIA IN THE YEARS 2005 - 2015

SITC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
0	2.43	2.44	2.29	2.47	2.73	3.13	2.66	2.28	2.48	1.99	1.35
1	3.53	3.50	3.18	2.98	2.88	3.23	3.56	3.57	3.48	3.20	2.80
2	-1.39	-1.26	-1.29	-1.13	-0.55	-0.74	-0.53	-0.38	-0.29	-0.49	-0.52
3	-4.87	-4.85	-4.84	-4.90	-4.45	-4.59	-4.42	-4.29	-4.51	-4.66	-4.51
4	1.90	1.43	1.11	1.17	0.84	1.04	1.27	0.69	0.50	1.03	0.85
5	1.40	1.55	1.38	1.30	1.73	1.73	1.66	1.60	1.63	1.59	1.55
6	0.12	0.10	0.00	0.17	0.44	0.24	0.30	0.41	0.48	0.28	-0.01
7	3.70	3.92	3.77	4.02	3.76	3.91	3.96	3.91	3.83	3.64	3.12
8	3.27	3.46	3.48	3.79	3.85	3.97	3.97	3.81	4.00	4.06	3.68
9	-0.80	-0.97	0.09	-0.52	-0.70	-0.28	-0.28	-0.69	-0.17	-0.18	0.16

Source: Own calculations.

Note: 0 - Food and live animals, 1- Beverages and tobacco, 2 - Crude materials, inedible, except fuels, 3 - Mineral fuels, lubricants and related materials, 4 - Animal and vegetable oils, fats and waxes, 5 - Chemicals and related products, n.e.s., 6 - Manufactured goods classified chiefly by material, 7 - Machinery and transport equipment, 8 - Miscellaneous manufactured articles, 9 - Commodities and transactions not classified elsewhere in the SITC.

Russia has revealed comparative advantage in SITC group 3 - "Mineral fuels" and in the SITC group 2 - "Crude materials, inedible, except fuels" in the long term. In the year 2015 there was registered small advantage in the group 6 - "Manufactured goods". There are not relevant reasons for changes by revealed comparative advantages for Russia in the group 2 and 3 in the near future. In the group 6 it can be different. If the mutual trade sanctions will be dissolved, the advantage could be back to the EU in this group in the future.

The GL index shows us the size of intra-industry trade between the EU and Russia. Development of GL index of EU-Russia in years 2005-2015 is in Table 2. After the analysis of the results, we can assume that there are some vivid changes in intra-industry trade between the EU and Russia in the observed period of time. The biggest increase between 2014 and 2015 was 66% in SITC group 0 and 20.6% in the SITC group 9. The biggest decline was 17.7% in the group 6.

TABLE 2. GRUBEL-LLOYD INDEX - EU - RUSSIA IN THE YEARS 2005 - 2015

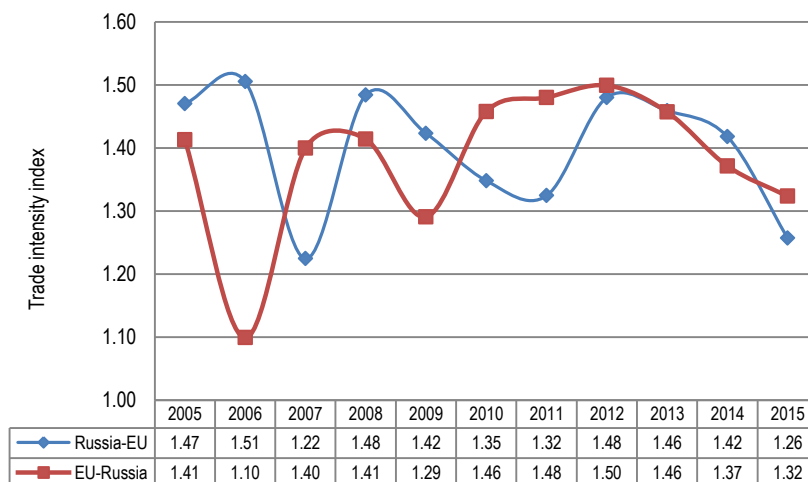
SITC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
0	0.28	0.26	0.25	0.21	0.20	0.14	0.22	0.28	0.24	0.36	0.60
1	0.10	0.10	0.11	0.13	0.17	0.13	0.09	0.09	0.09	0.12	0.18
2	0.24	0.28	0.32	0.37	0.52	0.43	0.51	0.59	0.64	0.55	0.53
3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
4	0.43	0.58	0.64	0.61	0.83	0.76	0.65	0.89	0.98	0.73	0.83
5	0.62	0.54	0.53	0.56	0.45	0.47	0.49	0.49	0.48	0.50	0.52
6	0.77	0.78	0.82	0.91	0.97	0.85	0.88	0.96	0.99	0.90	0.74
7	0.09	0.07	0.06	0.05	0.07	0.07	0.06	0.06	0.07	0.08	0.14
8	0.13	0.10	0.09	0.06	0.07	0.06	0.06	0.07	0.06	0.05	0.08
9	0.40	0.36	0.86	0.59	0.46	0.70	0.61	0.47	0.69	0.68	0.82

Source: own calculations.

Note: 0 - Food and live animals, 1- Beverages and tobacco, 2 - Crude materials, inedible, except fuels, 3 - Mineral fuels, lubricants and related materials, 4 - Animal and vegetable oils, fats and waxes, 5 - Chemicals and related products, n.e.s., 6 - Manufactured goods classified chiefly by material, 7 - Machinery and transport equipment, 8 - Miscellaneous manufactured articles, 9 - Commodities and transactions not classified elsewhere in the SITC.

The highest values of intra-industry trade measured by the Grubel-Lloyd index between the EU and Russia were by groups 4, 9, and 6 due to mutual exports in these groups in selected period. The lowest intra-industry trade was in SITC groups 3 and 8.

FIGURE 6. THE TRADE INTENSITY INDEX RUSSIA AND EU IN THE YEARS 2005 - 2015



Source: Own calculations.

To evaluate size of mutual trade between the EU and Russia we used the trade intensity index. Figure 6 shows trend of trade intensity index of Russia and EU ($TII_{Russia-EU}$) and of the EU and Russia ($TII_{EU-Russia}$) in years 2005-2015. In that time period $TII_{Russia-EU}$ was more than 1 and, therefore, we can note on the big activity of exporters from Russia to the EU market. This index recorded the biggest values in 2006, 2008 and 2012. From 2013 to 2015 the index was declining every year. Despite this decline the index did not drop below 1 in selected period of time.

$TII_{EU-Russia}$ as well as $TII_{Russia-EU}$ reached value more than 1 in the same period of time. It shows that the trade was more intensified as expected considering the position of EU in the world trade. The average value of $TII_{EU-Russia}$ reached 1.38 and it was 0.02 below the average value of $TII_{Russia-EU}$. $TII_{EU-Russia}$ declined in 2006 and 2009 significantly. From 2013 to 2015 the index declined from 1.46 to 1.32. $TII_{Russia-EU}$ still has relative high rate, indicating intensive trade of exporters from EU to Russia.

4. Conclusions

After the analysis of foreign trade, revealed comparative advantages, intra-industry trade and trade intensities between the EU and Russia, the following conclusions and recommendations are proposed. Three years have passed since the imposition of the mutual EU-Russia sanction due to the Russian-Ukrainian conflict. Trade has declined not only in sectors that are directly affected by sanctions, but as a result of the economic multiplier also in the sectors that are related to them. Trade has fallen almost in all items of goods, which has negative consequences for the EU producers. The impact of comparative advantages on the deepening of the EU's bilateral foreign trade relations with

Russia is significant. The EU depends on Russia mainly in the supply of energy and non-oil raw materials. It has to be noted, that in the near future, given the structure of the economy of the EU, enormous reductions in imports from Russia in these group of products are unlikely. Russia imports finished products to a larger extent from the EU. Therefore, the EU should continue to focus more on increasing export output, where it has comparative advantages (oils and fats, machinery and transport equipment, various ready-made and industrial products) in trade with Russia.

The intra-industry trade has shown some changes too. The reason was changing in proportion of export and import. The current situation has contributed to a mild "balance of power" between the EU and Russia. Despite the difficult situation, Russia is still an important EU trading partner. On the one hand, Russia represents a significant export market for European producers; on the other hand Russia is also an important supplier of raw and energy raw materials for the EU.

The trade intensity index has shown that mutual trade is intensive. Both indices $TII_{Russia-EU}$ and $TII_{EU-Russia}$ reached value more than 1 in selected period of time. However, the intensity has declined due to sanctions and declining price of oil every year since 2013.

Despite the current tense situation, Russia is an important trading partner of the EU, and the EU needs Russian energy resources for at least 20 years. If the EU wants to ascertain its energy security and not lose such a major market, it should address the tension with Russia. Subsequently, the EU can strengthen its relations with Russia. Otherwise, mutual trade relations can further deteriorate and Russia may tighten its relationship with other partners; especially with China or India that need energy resources for their further development (Xavier & Yamane, 2015).

This paper has also its limitations. Our research was focused on the period of time since 2005 to 2016. The results depend on the evaluation of the statistics from the past. In the new research it could be done a new multi-periodic model, which can predict more realistic trend of mutual trade relations between the EU and Russia.

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