

Foreign Trade Evolutions in the European Union

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Abstract *In this paper, the author presents the most significant evolutions in the international trade of the European Union. The research takes into consideration several aspects, namely the contributions of some countries to the total recorded across the EU, the analysis by groups of goods, within the study of both import/export and trade balance. To substantiate our analysis, based on the structure of the used dataset, we have capitalized the benefits of the regression method, developing two models, one for import and export each, which explain the dimension of the correlation between these indicators and their structure factors, grouped by categories of goods.*

Key words Analysis, regression, import, export, balance

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1. Introduction

The foreign trade is an important generator of economic growth, even if considering only the fact that the net export influences the level and modification of the Gross Domestic Product in each national economy. In our study, we aim to present the evolution of the international trade of the European Union, by emphasizing the factors that have contributed to the formation and dynamics of the trade indicators. The structure of the considered dataset offered two important factors: the grouping of goods and the countries' individual contribution.

2. Literature review

Römisch (2012) presents a new methodology that can be used for the evaluation of regional trade and effects of the economic crisis. Katsikeas, Piercy, and Ioannidis (1996) have described a model of export performance built on a sample of exporters from an EU country; they have identified significant factors who pose influence on the performance of exports. Puślecki (2015) has analyzed the role of foreign trade policy in the achievement of economic and political objectives derived from the specific interests of a country; he emphasizes the importance of the choice between liberalism and protectionism. Cardoso and Duarte (2015) have analyzed the Chinese policy on exchange rate for the national currency as impact factor on the foreign trade with EU as partner; they applied a Vector Error Correction model and revealed the competitive advantage of China resulted from the management of the exchange rate.

Cheptea *et al.* (2014) have analyzed the performances of the European Union in the field of international trade, specifically the export component, their findings, for the interval 1995-2009, outline the fact that the market share of EU goods remained at a high level, in comparison to the other exporters (US, Japan), whose share is lower. The study of Djennas *et al.* (2012) emphasizes the divergent character of the foreign trade competitiveness within the Eurozone. Kotysh (2014) realizes a theoretical approach on the foreign trade. Pagliacci *et al.* (2016) have developed an econometric model dedicated to the analysis of Romania's foreign trade. Studies on the use of multiple regressions in economic analyses, specifically at macroeconomic level, were elaborated by many authors; we outline the works of Anghelache and Anghel (2016), Dudu and Moscu (2016), Anghelache *et al.* (2016).

3. Research methodology and data

The research methodology employed in this study is based on the balance method, according on which the total value is made by summarizing subtotals, while the evolution of the total value is the arithmetical sum of parts' individual evolutions. This can be described under the following formulas:

$$T = \sum_{i=1}^n t_i \quad (1)$$

Where we can consider:

T = the total value of trade,

t_i = one component of trade activity.

Therefore,

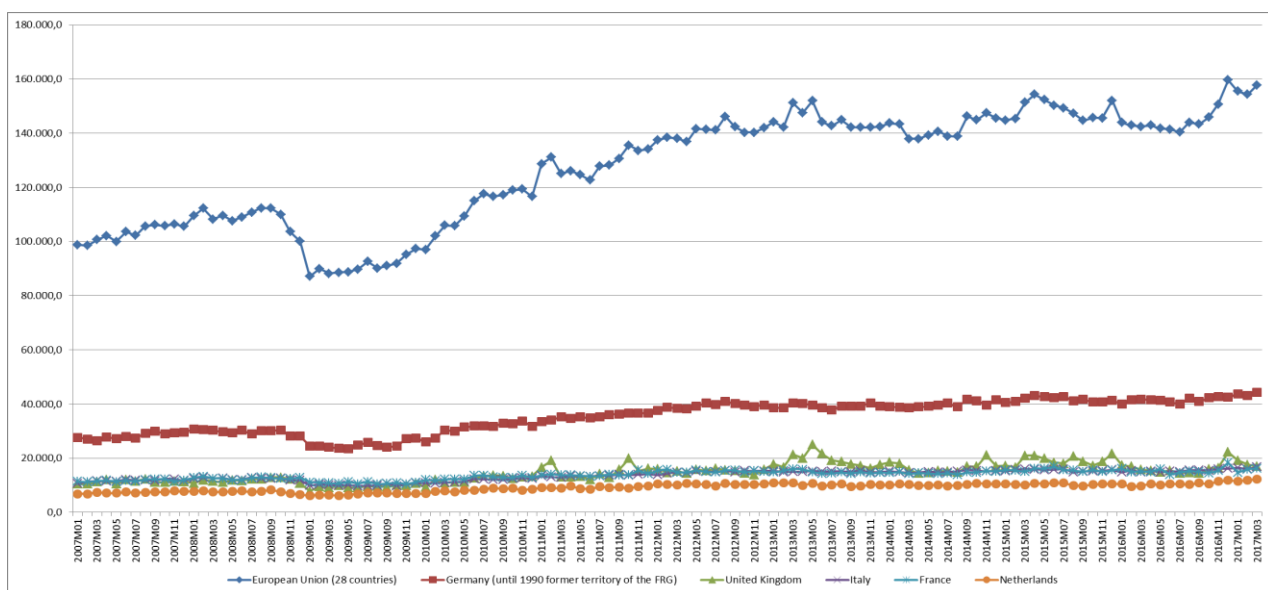
$$\Delta T = \sum_{i=1}^n \Delta t_i \quad (2)$$

The data were taken from the Eurostat database, and the dataset used in the study is related to the *EU-28 international trade, monthly data*. The data are available for the interval January 2007 – March 2017, per countries and categories of goods (intermediate, capital and consumer goods). The data are seasonally and working day adjusted, and they reflect the commercial relationships of the EU 28 and its member countries with partners outside the European Union. We have used these criteria to analyze the major contributions to the evolution of the main indicators that are the imports, exports and balance of foreign trade. To increase the information potential of our study, we have also employed the multiple regression method, in order to measure, for the available dataset, the intensity of the correlation between the main indicators, namely the export and the import, and their influence factors delimited by the three groups of goods. To estimate these models, we have used specialized data analysis software, applying the OLS method on the appropriate datasets for the specified indicators.

4. Results and discussions

4.1. Evolution of exports

First, we shall analyze the situation of exports within the European Union. The figure below details the evolution of the total indicator and the most significant five influences per countries (the hierarchy is corresponding to the last quarter in the dataset):

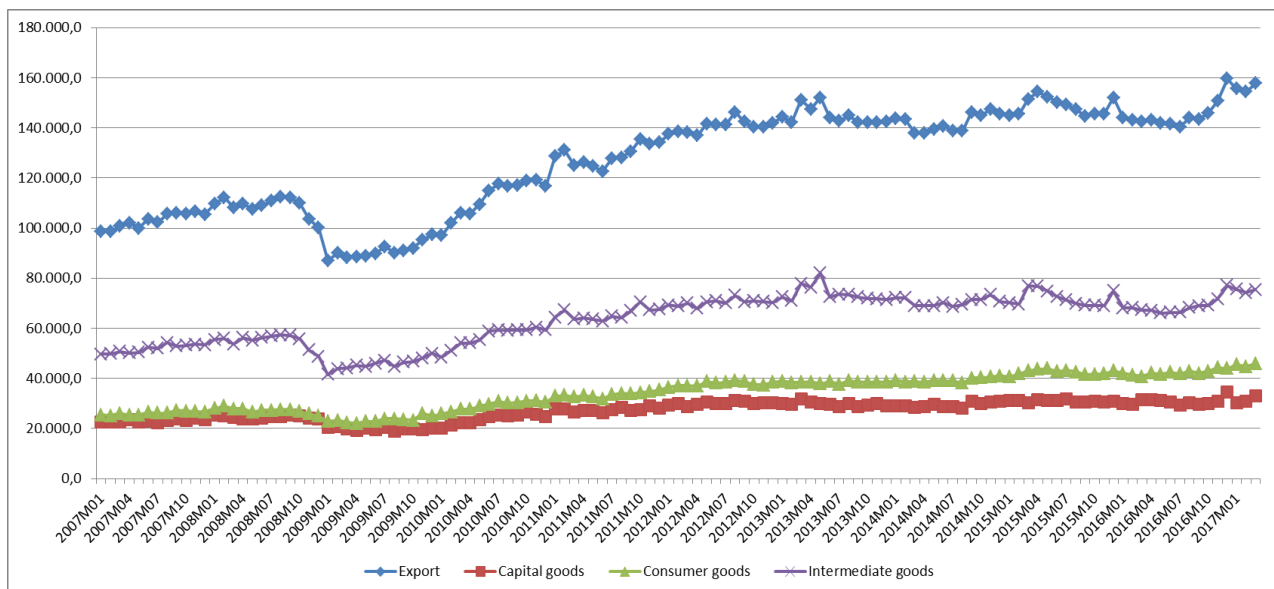


Data source: Eurostat online database, graphical representation by the author

Figure 1. Export evolution in EU28 and most significant five countries

We can observe that the most significant influence corresponds to Germany, followed by Great Britain, France, Italy and the Netherlands. For the entire interval analyzed, the German exports hold a share of 27.73%, UK has 11.54%, 10.69% is associated with Italy, France accounted for 10.83%, and the Netherlands contributed with 7.17%. The smallest contributions of the EU-28 exports are presented by Latvia (0.19%), Luxembourg (0.16%), Malta (0.1%) and Cyprus (0.04%).

The classification by categories of goods details the following:



Data source: Eurostat online database, graphical representation by the author

Figure 2. Evolution of exports within EU by categories of goods

The chart above outlines the major contribution of the intermediate goods, while the capital goods have the less sizable impact. Considering the total data, the intermediate goods cover a share of almost 50% (49.79%), consumer goods amount for 26.97% and the capital goods for some 21%.

To further substantiate our study, we propose an econometric regression model that can be used for forecasting. Based on the same dataset (time range Jan.2007 – Mar. 2017 and the grouping by three categories of goods, we shall study the intensity of each category on the total variable. The formula of the model proposed has the following structure:

$$EXP = \text{const} + \beta_1 * CAP + \beta_2 * CON + \beta_3 * INT \quad (3)$$

Where:

Const: constant parameter; β_1 , β_2 , β_3 : parameters of the regression model;

CAP: export of capital goods; CON: export of consumer goods; INT: export of intermediate goods.

The estimation of the model produced the following results (the parameters were estimated according to the least squares method) (see table 3). Given the characteristics of the existing correlation between the independent and the dependent variables, the values of the statistical tests: *R-squared* and *Adjusted R-squared* are very close to unit. The formula of the model is:

$$EXP = 626.630 + 0.995264 * CAP + 1.11900 * CON + 0.966334 * INT$$

The model does not reflect the quotas of the three categories of goods, as the highest regression quotient is associated to the consumer goods. That is, for an increase by one million euros of the export of consumer goods, the total export will rise by 1.119 million euros. The capital goods and intermediary goods factors have values below unit. This model can be used, as said before, to elaborate forecasts and test the accuracy of the provisioned values. Also, the high value of the *const* parameter reveals the existence of additional independent variables, which exert a combined positive influence on the European Union (28

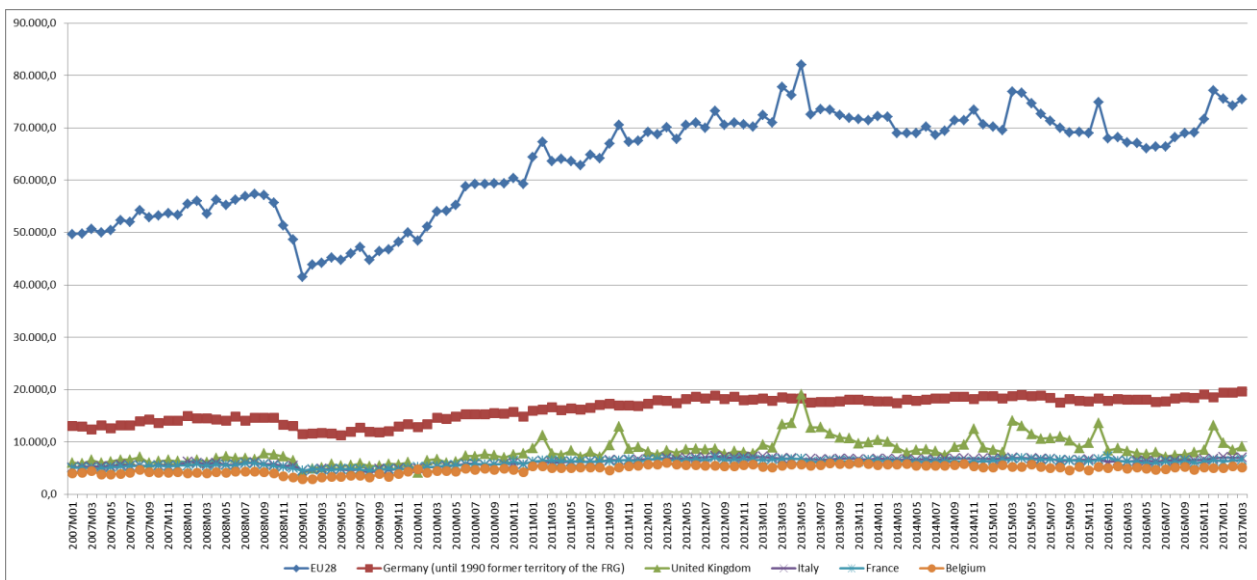
countries) exports' evolution. The multidimensional character of the data source allows us to perform crosstab analyses, that is, in the scope of our research, analysis within analysis.

Dependent variable: EXP

	coeficient	eroarea std.	t-ratio	p-value
const	626,630	536,706	1,168	0,2453
CAP	0,995264	0,0612178	16,26	5,20e-032 ***
CON	1,11900	0,0287200	38,96	1,37e-069 ***
INT	0,966334	0,0197014	49,05	8,63e-081 ***
Mean dependent var		127145,5		
S.D. dependent var		20649,93		
Suma pătratelor reziduurilor		45665408		
Eroarea standard a regresiei		619,4699		
R-pătrat neajustat		0,999122		
Adjusted R-squared		0,999100		
F(3, 119)		45149,61		
P-value (F)		1,2e-181		
Log-likelihood		-963,2465		
Akaike criterion		1934,493		
Schwarz criterion		1945,742		
Hannan-Quinn		1939,062		
rho		0,322274		
Durbin-Watson		1,335525		

Figure 3. Multiple regression model: evolution of export per categories of goods

Therefore, in the next section, we will study the main contributions, per country, to the evolution of export for intermediate goods. We shall consider the most significant five countries, sorted upon the values of their amount of intermediate goods exports. These countries are: Germany, United Kingdom, Italy, France and Belgium. The indicators are presented in the figure below:



Data source: Eurostat online database, graphical representation by the author

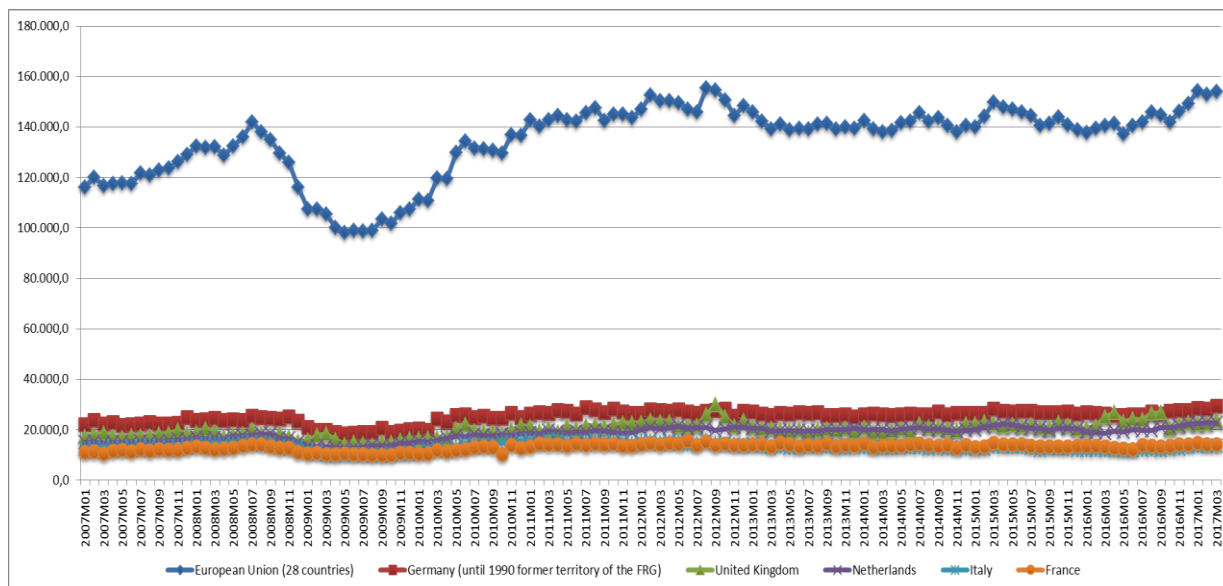
Figure 4. Export of intermediate goods, main contributor countries

The evolution of Germany seems to be pretty linear, while the United Kingdom presents the most observable peaks across the interval studied. Considering the criteria stated above, the five countries

selected have the following shares in the total export of intermediate goods: Germany = 25.68%, UK=13.11%, Italy 9.75%, France 9.46% and Belgium 7.63%. Their combined share amounts for more than 65% of the total EU countries included in our panel.

4.2. Evolution of imports

The imports of the EU28 countries between January 2007 – March 2017 have a level of 16,580,167.2 million Euro. The main contributions to the achievement of this level were specific to the following five countries: Germany, United Kingdom, Netherlands, Italy and France. We have considered the hierarchy of the most significant five contributions in the total import.

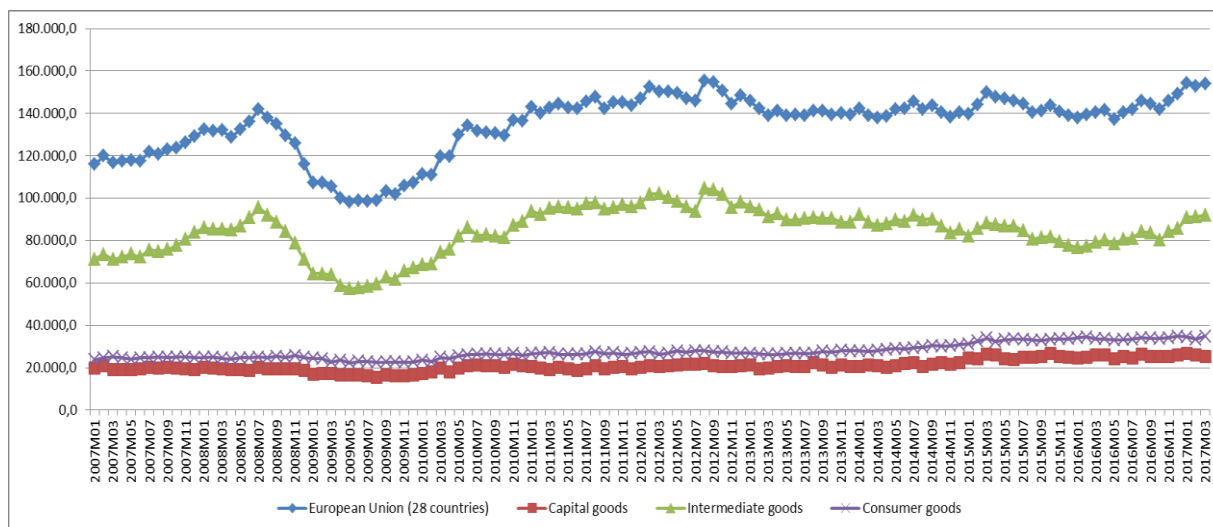


Data source: Eurostat online database, graphical representation by the author

Figure 5. Total import and first five countries

The share of the main five countries with significant values of imports across the period analyzed are the following: Germany (18.64%), UK (14.94%), the Netherlands (13.68%), Italy and France have percent values less than 10%, for a combined share of 66.75% of the total for European Union (28 countries). The smallest contributions are associated with Luxembourg, Latvia, Estonia, Cyprus and Malta (all below 0.3%).

The situation of imports per types of goods is reflected in the figure 6 below:



Data source: Eurostat online database, graphical representation by the author

Figure 6. Imports in the European Union, by categories of goods

As in the case of exports, the main share in the total imports is associated to intermediate goods, amounting for 62.65%, then we have consumer goods (20.53%) and the capital goods (15.6%). We propose an econometric model for the analysis of the intensity of correlations between the total imports and the imports by categories of goods. The model should be able to outline the intensity of the influence exerted by each independent variable on the total value of imports. The general structure of the multiple regression model can be represented as in the following equation:

$$\text{IMP} = \text{const} + \beta_1 * \text{ICAP} + \beta_2 * \text{ICON} + \beta_3 * \text{IINT} \quad (4)$$

Where:

Const: constant parameter; $\beta_1, \beta_2, \beta_3$: parameters of the regression model;

ICAP: import of capital goods; ICON: import of consumer goods; IINT: import of intermediate goods.

The result of the model estimation is presented in the following figure 7:

Dependent variable: IMP

	coeficient	eroarea std.	t-ratio	p-value
const	-95,0712	367,078	-0,2590	0,7961
ICAP	0,879448	0,0449129	19,58	5,04e-039 ***
IINT	1,00487	0,00374473	268,3	2,01e-167 ***
ICON	1,13964	0,0334393	34,08	3,09e-063 ***
Mean dependent var		134798,1		
S.D. dependent var		14307,03		
Suma pătratelor reziduurilor		20871004		
Eroarea standard a regresiei		418,7918		
R-pătrat neajustat		0,999164		
Adjusted R-squared		0,999143		
F(3, 119)		47421,79		
P-value (F)		6,4e-183		
Log-likelihood		-915,0932		
Akaike criterion		1838,186		
Schwarz criterion		1849,435		
Hannan-Quinn		1842,756		
rho		-0,189354		
Durbin-Watson		2,353080		

Figure 7. Multiple regression model: evolution of import per categories of goods

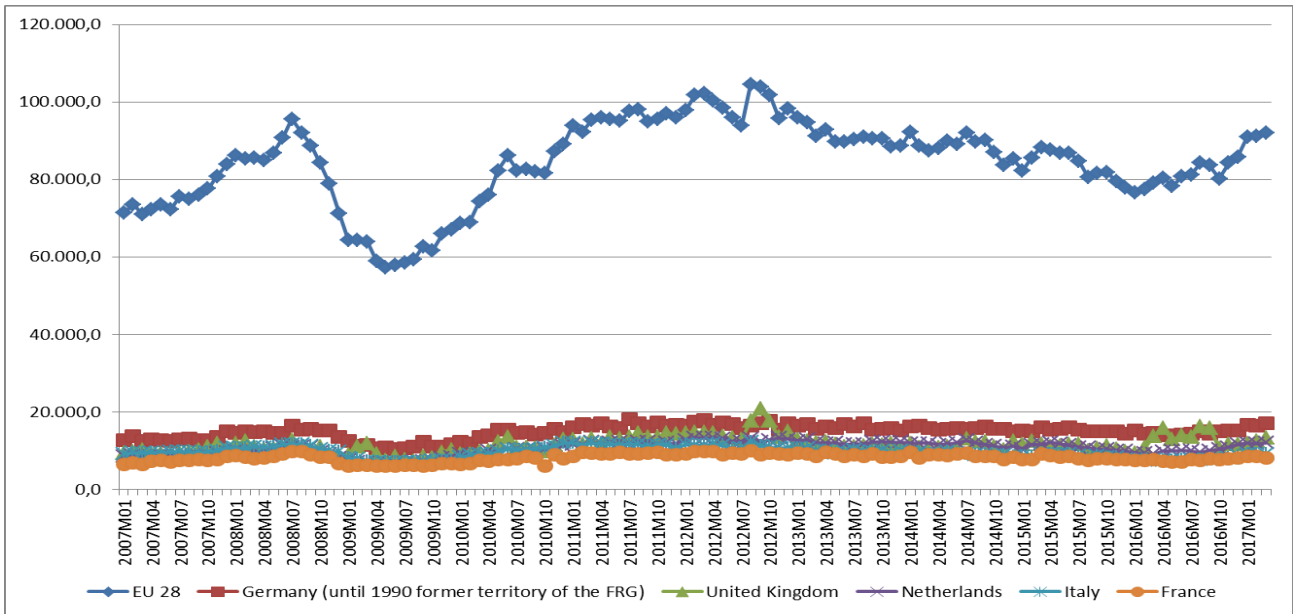
Based upon the results provided by the econometric analysis software, the final formula of the model is the following:

$$\text{IMP} = -95.0712 + 0.79448 * \text{ICAP} + 1.13964 * \text{ICON} + 1.00487 * \text{IINT}$$

We observe that the values of the *R-Squared* and *Adjusted R-Squared* are very close to unit, which can be explained through the mathematical relationship between the four variables of the model. Similar to the case of exports, the highest influence within the model corresponds to the consumer goods, with intermediary goods having a smaller impact, and the capital goods are characterized by a quotient below 1.

The value of the free term is negative and much higher than the regression quotients, giving evidence on the existence of additional influence factors that can be studied in the scope of future analyses.

The evolutions of the imports of intermediate goods for the five countries with the highest quotas for the entire dataset are presented in the figure 8 below:



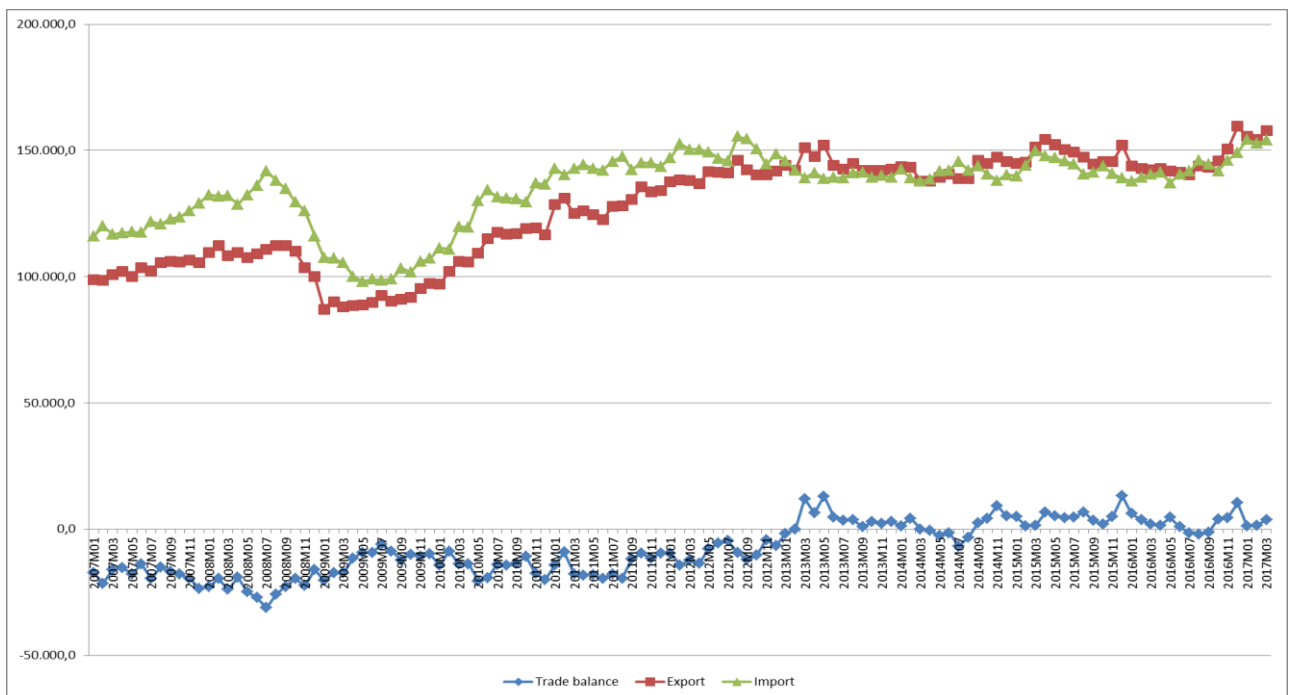
Data source: Eurostat online database, graphical representation by the author

Figure 8. Imports of intermediate goods, EU 28 and main five countries

The contributions of the five countries occupying the first places in the hierarchy are: Germany (17.73%), United Kingdom (13.88%), the Netherlands (12.60%), Italy (11.44%) and France (9.70%). To be noted that these countries have a total share of over 65%.

4.3. Evolution of the trade balance

Regarding the trade balance, the evolution of the indicator is detailed in the following chart:



Data source: Eurostat online database, graphical representation by the author

Figure 9. Evolution of the trade balance, EU 28

The trade balance is characterized by a sinusoid-like evolution, with values constantly below zero level during the period Jan.2007 – Feb.2013, subsequently the values are generally positive. We outline a cyclical pattern of increases and decreases, but the negative values are less prominent after March 2013. Also, we can observe the relative similar paths of import and export, which present, during the recent interval, a general trend of growth.

5. Conclusions

The foreign trade of the European Union, with partners from outside the EU, has increased steadily during the period subjected to analysis. The balance between exports and imports does not have a regular evolution across the years, the first part of the interval shows deficit of the international trade balance, with exports gaining the upper hand for most reference dates after February 2013. The main contributions to the formation of the EU 28 foreign trade activities have been analyzed depending on the countries' share in the total amount of the indicator, and we come to the conclusion that a group of five countries hold a significant majority.

Also, we have measured the share of each group of goods, and the share of intermediate goods proved to be the highest, both for imports and exports. We have included, in our analysis, econometric models of multiple regressions that have revealed the intensity of the relationship between each category of goods included in the foreign trade and the total imports and exports. We consider that the results of the econometric approach provide additional information, useful for the observation and analysis of the international trade.

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