The Relationship between Spatial Interdependencies in the European Union and the Trade-I

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Abstract: The article treats the links between imports of EU countries and relative distances between them. Mostly there are linear regressions equations that modeling the import relative to the spatial relations between states.

Keywords: graph; European Union; Bellman; trade; export; import

1. The Development of Trade in the Context of Globalization

Although there is no universally accepted definition, the term globalization is often used in economic literature, the purpose of internationalization of trade in goods and services, capital and labor.

In conditions of globalization, of growing interdependence of the world's countries and the complexity of the global economy, we are seeing a diversification of increasingly sharp trade. Factors that influenced the development of trade relations, the global economic circuit are mainly economic, and we refer to scientific and technical progress, deepening international division of labor and, sometimes, these factors putting on a political form.

Economic flows occurring in the global economy reveals changes in the economic development of states, changes which stay at the underlying economic structure and dynamics of the circuit.

In this context, foreign trade (import and export) is an important component of analysis and assessment of an economic structure that aim for, among other components, macrostabilization and building an efficient economy.

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With the advent in 1776 of the work of Adam Smith, The Wealth of Nations and waiver of mercantilist doctrine, free trade has become a way of enhancing mutual income of the countries that were involved in this kind of activity.

Following the Great Depression of 1929-1933, foreign trade experienced a sharp decrease due to the establishment and protectionism and trade barriers.

Between the end of the Second World War and the mid-1970s, trade has experienced significant growth when its volume recorded an annual growth rate of 5.8%, while production registered an annual growth rate 3.9%. After 1975 until the late 1980s, both production volumes and trade volumes have declined growth rates of around 4.1% per year, i.e. 3.3% per year ([1]).

An important role in the development of international trade theory have had after 1980 neoliberal theorists, Milton Friedman and Friedrich von Hayek August, who believed that the state should have a role traditionally supervisor of order.

Until the 1980s, the trend of openness to foreign markets was higher for industrial countries to emerging countries. After this period, however, there have been major changes in the structure of trade in terms of emerging countries.

The rapid growth of domestic production in the emerging countries, which led to the economic expansion of the early 2000s, increased the share of these countries in all international trade from 19% in the early 1970s to over 30% in 2002.

Progress in recent years is based on the competitiveness of the countries of the world which is due mainly financial and trade interdependence. As globalization is in full swing, international trade, the premise of sustainable development of all parts of the world economy, constitute the main vector of its manifestation.

The increase of the level and dynamics of trade flows, capital flows, information flows and the degree of labor mobility are influenced by globalization.

2. The Determination of Minimum Length of Roads Between EU Countries

In this section we shall determine the minimum lengths of the roads between EU countries for the purposes of considering only the existence arcs (actually the edges, since this is an undirected graph) between them, and not the actual distance.

First, let consider the graph of European Union in terms of links that is, if two countries have a common border we assign an edge of unitary length between them.

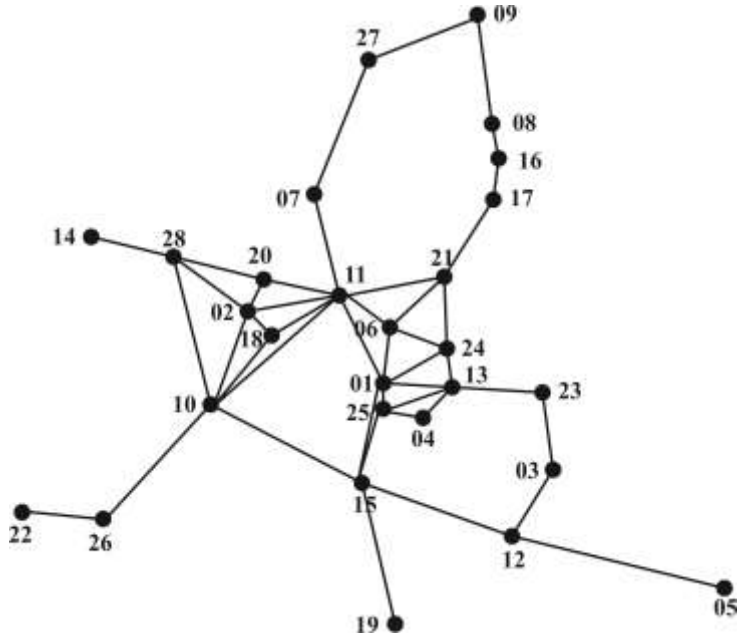

Figure 1

Source: (Ioan & Ioan, 2016)

where:

01 – Austria, 02 – Belgium, 03 – Bulgaria, 04 – Croatia, 05 – Cyprus, 06 - Czech Republic, 07 – Denmark, 08 – Estonia, 09 – Finland, 10 – France, 11 – Germany, 12 – Greece, 13 – Hungary, 14 – Ireland, 15 – Italy, 16 – Latvia, 17 – Lithuania, 18 – Luxembourg, 19 – Malta, 20 – Netherlands, 21 – Poland, 22 – Portugal, 23 – Romania, 24 – Slovakia, 25 – Slovenia, 26 – Spain, 27 – Sweden, 28 - United Kingdom.

Considering now the matrix of the graph $D_1=(d_{ij})\in M_{28}(R)$ where $d_{ij}=1$ when between x_i and x_j (the nodes appropriate to the countries) there exists an arc, $d_{ij}=\infty$ if there isn't an arc between x_i and x_j and $d_{ii}=0$ $\forall i=\overline{1,28}$.

The determination of minimum distances in the terms of minimal number of arcs between two nodes can be made with the Bellman-Kalaba algorithm which consists of several steps:

Step 0: Let fix a node x_k for the determination of minimum lengths of roads from the other nodes to it.

Step 1: Noting $v^{(i)}\in\mathbf{R}^{28}$ the vector containing the minimum lengths of roads from the nodes $\{x_1,...,x_{28}\}$ to x_k with most "i" arcs, we have that the column matrix "k" of D_1 contains lengths of roads formed with a single arc from x_i, $i=\overline{1,28}$ to x_k.

Step 2: Assume that were determined $v^{(i)}$, $i=\overline{1,s}$ with $s\geq 1$ and the matrix $D_s=\left(\tilde{d}_{ij}\right)$ $\in M_{28}(\mathbf{R})$ where $\tilde{d}_{ij}=d_{ij}+v_j^{(s)}$, $i,j=\overline{1,n}$ is the minimum length of the road with most (s+1) arches from the x_i to x_k, necessarily passing through x_j. It is then determined, $v_i^{(s+1)}=\min\limits_{j=1,28}\tilde{d}_{ij}$, $i=\overline{1,28}$ which represents the minimum length of the roads with most than "s+1" arcs from x_i the node reference x_k, thus generating the vector $v^{(s+1)}$.

Step 3: The algorithm is repeated until for $t\geq 1$: $v^{(t+1)}=v^{(t)}$ that is the minimum length of not more than "t" arcs may not decrease at the addition of an additional arc.

The Bellman-Kalaba algorithm, for the matrix of the graph (appendix A.1) gives the matrix of minimum distances between countries (appendix A.2) that is the minimum number of arcs necessary for the transition from one country to another.

Because this matrix has the great disadvantage that regions far from the reference country have greater values we shall act as follows.

We first make the hypothesis that if between two countries there exists a shorter road the trade exchanges are bigger. If a volume of goods must be carried from one country to another (situated at the distance "m" – in terms of edges) let note with t the necessary time. The necessary time for carry the same volume to a road of length 1 is therefore $\frac{t}{m}$. After this analysis, the provider country take into consideration an export of a volume equal with $\frac{V}{m}$. After these, we shall transform the matrix from table A.2, let say $P=\left(p_{ij}\right)\in M_{28}(\mathbf{R})$ in the matrix with elements $\tilde{G}=$ $\left(\tilde{g}_{ij}\right)\in M_{28}(\mathbf{R})$ where $\tilde{g}_{ij}=\frac{1}{p_{ij}}$ if $i\neq j$ and $\tilde{g}_{ii}=0$, $i,j=\overline{1,28}$ (because a country cannot do exports or imports in itself). The elements of matrix $\tilde{G}$ mean the degree of strength of links between countries.

One correction we shall make at this matrix. Because we want to multiply $\tilde{G}$ with column vectors which give informations about various economic indicators, the sum of the products will not reflects the global link of the involved country to the others. For this reason, we shall normalize the elements of $\tilde{G}$ obtaining in the

final, the matrix $G=(g_{ij}) \in M_{28}(\mathbf{R})$ where $g_{ij}=\frac{\frac{1}{p_{ij}}}{\sum_{\substack{j=1 \\ j\neq i}}^{n}\frac{1}{p_{ij}}}$ if $i\neq j$, $g_{ii}=0$, $i,j=\overline{1,28}$ (appendix A.3). This will be the reference matrix which it be used in all our computations.

3. The Analysis of the Imports in EU Countries

In this section we shall analyze the relations between the export of EU countries and imports of each of them.

In Appendix A.4 and A.5 we have the tables of exports and imports of European Union countries during 2004-2015.

Multiplying the matrix G with the values from tables A.4 and A.5, we find the tables A.8-A.11 in Appendix A.6.

Because not all exports from one country will be transferred to the EU reference country, we shall search if there is a linear dependence between real imports and computed imports (after the results from tables A.8-A.11).

In the case of Austria, from Appendix A.7 we can see that is a strong link between the two groups of indicators (R^2=0.9691), having finally:

IM_AT(t)=0.0203EX_BE(t)+0.0136EX_BG(t)+0.0203EX_HR(t)+0.0136EX_CY(t)+0.0406EX_CZ(t)+0.0203EX_DK(t)+0.0081EX_EE(t)+0.0102EX_FI(t)+0.0203EX_FR(t)+0.0406EX_DE(t)+
0.0203EX_EL(t)+0.0406EX_HU(t)+0.0102EX_IE(t)+0.0406EX_IT(t)+0.0102EX_LV(t)+
0.0136EX_LT(t)+0.0203EX_LU(t)+0.0203EX_MT(t)+0.0203EX_NL(t)+0.0203EX_PL(t)+
0.0102EX_PT(t)+0.0203EX_RO(t)+0.0406EX_SK(t)+0.0406EX_SI(t)+0.0136EX_ES(t)+

0.0136EX_SE(t)+0.0136EX_UK(t)+18112.5424

where IM_ means real imports, EX_ means real exports, t – the reference time and the abbreviations for countries are the usual: Austria – AT, Belgium – BE, Bulgaria – BG, Croatia – HR, Cyprus – CY, Czech Republic – CZ, Denmark – DK, Estonia – EE, Finland – FI, France – FR, Germany – DE, Greece – EL, Hungary – HU, Ireland – IE, Italy – IT, Latvia – LV, Lithuania – LT, Luxembourg – LU, Malta – MT, Netherlands – NL, Poland – PL, Portugal – PT, Romania – RO, Slovakia – SK, Slovenia – SI, Spain – ES, Sweden – SE, United Kingdom – UK.

A comparison of regression coefficients and percentages imports from studied countries (Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 1) indicates that there are no large differences except Croatia, Slovakia and Slovenia (figure 3). Also, we can see that the real exports of EU-countries in Austria are below of those suggested by the regression equation which means that imports are below the potential offered by its geographic position.

The average distance between real data and those from the regression is: 1.36%.

Table 1. The correlation between the coefficients of regression and the real exports of EU-countries in Austria (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	-	-	**Italy**	4.06%	2.10%
Belgium+Luxembourg	4.06%	0.85%	**Latvia**	1.02%	0.37%
Bulgaria	1.36%	1.80%	**Lithuania**	1.36%	0.43%
Croatia	2.03%	6.30%	**Malta**	2.03%	0.32%
Czech Republic	4.06%	4.50%	**Netherlands**	2.03%	0.91%
Denmark	2.03%	0.70%	**Poland**	2.03%	1.80%
Estonia	0.81%	0.32%	**Portugal**	2.03%	0.92%
Finland	1.02%	0.71%	**Romania**	1.02%	2.30%
France	2.03%	0.87%	**Slovakia**	2.03%	5.70%
Germany	4.06%	4.70%	**Slovenia**	4.06%	7.90%
Greece	2.03%	0.66%	**Spain**	4.06%	0.97%
Hungary	4.06%	5.00%	**Sweden**	1.36%	1.00%
Ireland	1.02%	1.10%	**United Kingdom**	1.36%	0.57%

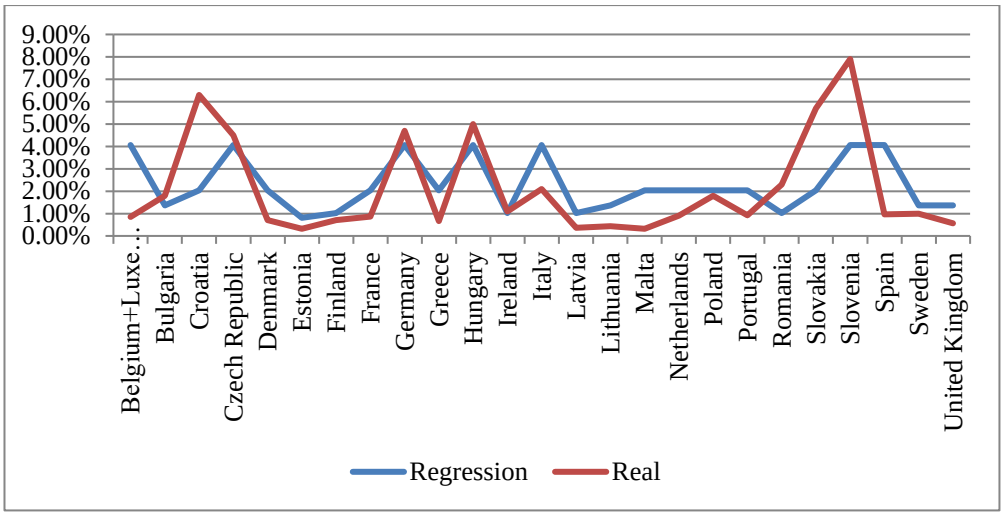

Figure 2. The relationship between exports based on distances and the real exports in 2013 in Austria (in percent)

In the case of **Belgium**, from Appendix A.8 we can see that is a strong link between the two groups of indicators (R^2=0.9536), having finally:

IM_BE(t)=0.047EX_AT(t)+0.0235EX_BG(t)+0.0235EX_HR(t)+0.0235EX_CY(t)+0.047EX_CZ(t)+0.047EX_DK(t)+0.0187EX_EE(t)+0.0235EX_FI(t)+0.094EX_FR(t)+0.094EX_DE(t)+
0.0313EX_EL(t)+0.0313EX_HU(t)+0.047EX_IE(t)+0.047EX_IT(t)+0.0235EX_LV(t)+
0.0313EX_LT(t)+0.094EX_LU(t)+0.0313EX_MT(t)+0.094EX_NL(t)+0.047EX_PL(t)+
0.0313EX_PT(t)+0.0235EX_RO(t)+0.0313EX_SK(t)+0.0313EX_SI(t)+0.047EX_ES(t)+
0.0313EX_SE(t)+0.094EX_UK(t)+35798.9745

Also, in the case of **Luxembourg**, from Appendix A.9 we can see that is a weak link between the two groups of indicators (R^2=0.4959), having finally:

IM_LU(t)=0.0016EX_AT(t)+0.0031EX_BE(t)+0.0008EX_BG(t)+0.0008EX_HR(t)+
0.0008EX_CY(t)+0.0016EX_CZ(t)+0.0016EX_DK(t)+0.0006EX_EE(t)+0.0008EX_FI(t)+
0.0031EX_FR(t)+0.0031EX_DE(t)+0.001EX_EL(t)+0.001EX_HU(t)+0.001EX_IE(t)+
0.0016EX_IT(t)+0.0008EX_LV(t)+0.001EX_LT(t)+0.001EX_MT(t)+0.0016EX_NL(t)+
0.0016EX_PL(t)+0.001EX_PT(t)+0.0008EX_RO(t)+0.001EX_SK(t)+0.001EX_SI(t)+
0.0016EX_ES(t)+0.001EX_SE(t)+0.0016EX_UK(t)+11351.0435

A comparison of regression coefficients and percentages imports from studied countries *(Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 2*) indicates that there are no large differences except Germany (figure 3) for which the imports are much below the distance and on the other side Ireland and Netherlands which imports exceed much distances to both countries. Also, we can see that the real exports of EU-countries in Belgium and Luxembourg are below of

those suggested by the regression equation which means that imports are below the potential offered by its geographic position.

The average distance between real data and those from the regression is: 2.46%.

Table 2. The correlation between the coefficients of regression and the real exports of EU-countries in Belgium+Luxembourg (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	4.70%	1.80%	**Italy**	4.70%	3.20%
Belgium+Luxembourg	-	-	**Latvia**	2.35%	1.80%
Bulgaria	2.35%	3.30%	**Lithuania**	3.13%	1.60%
Croatia	2.35%	1.80%	**Malta**	3.13%	0.83%
Czech Republic	4.70%	3.10%	**Netherlands**	9.40%	17.00%
Denmark	4.70%	1.60%	**Poland**	4.70%	2.70%
Estonia	1.87%	2.20%	**Portugal**	3.13%	3.40%
Finland	2.35%	3.60%	**Romania**	2.35%	1.80%
France	9.40%	9.10%	**Slovakia**	3.13%	1.80%
Germany	9.40%	4.90%	**Slovenia**	3.13%	1.10%
Greece	3.13%	1.20%	**Spain**	4.70%	3.20%
Hungary	3.13%	1.90%	**Sweden**	3.13%	5.80%
Ireland	4.70%	13.00%	**United Kingdom**	9.40%	5.50%

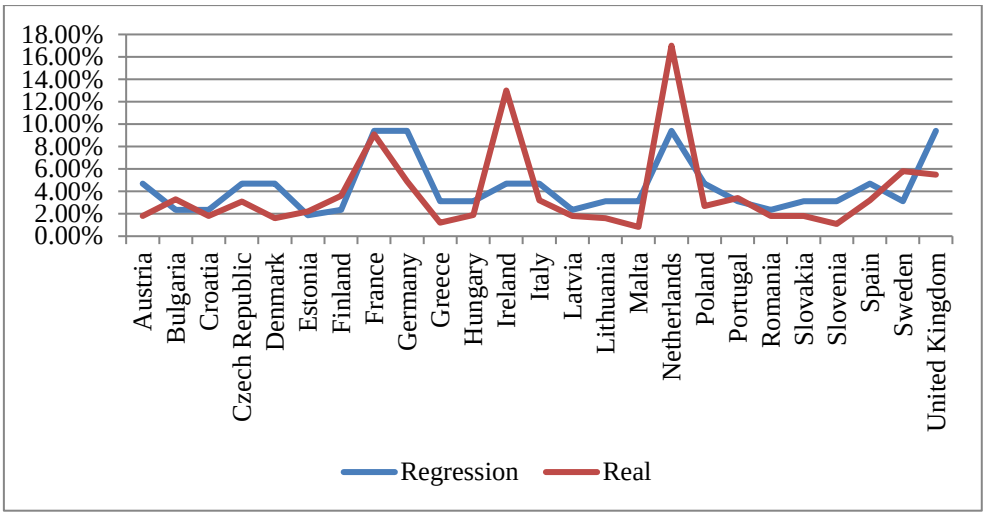

Figure 3. The relationship between exports based on distances and the real exports in 2013 in Belgium+Luxembourg (in percent)

In the case of **Bulgaria**, from Appendix A.10 we can see that is a strong link between the two groups of indicators (R^2=0.8898), having finally:

IM_BG(t)=0.0099EX_AT(t)+0.0074EX_BE(t)+0.EX_BG(t)+0.0099EX_HR(t)+0.0149EX_CY(t)+
0.0074EX_CZ(t)+0.006EX_DK(t)+0.0042EX_EE(t)+0.0042EX_FI(t)+0.0099EX_FR(t)+
0.0074EX_DE(t)+0.0298EX_EL(t)+0.0149EX_HU(t)+0.006EX_IE(t)+0.0149EX_IT(t)+
0.005EX_LV(t)+0.006EX_LT(t)+0.0074EX_LU(t)+0.0099EX_MT(t)+0.006EX_NL(t)+
0.0074EX_PL(t)+0.006EX_PT(t)+0.0298EX_RO(t)+0.0099EX_SK(t)+0.0099EX_SI(t)+
0.0074EX_ES(t)+0.005EX_SE(t)+0.0074EX_UK(t)-13417.9939

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 3*) indicates that there are no large differences except Greece (figure 4) for which the imports are much higher than the distance between them. Also, we can see that the real exports of EU-countries in Bulgaria are closer to those suggested by the regression equation which means that imports depend preferential from the potential offered by its geographic position.

The average distance between real data and those from the regression is: 0.54%.

Table 3. The correlation between the coefficients of regression and the real exports of EU-countries in Bulgaria (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.99%	0.57%	**Italy**	1.49%	0.48%
Belgium+Luxembourg	1.48%	0.18%	**Latvia**	0.50%	0.17%
Bulgaria	0.00%		**Lithuania**	0.60%	0.21%
Croatia	0.99%	0.42%	**Malta**	0.99%	0.11%
Czech Republic	0.74%	0.47%	**Netherlands**	0.60%	0.17%
Denmark	0.60%	0.12%	**Poland**	0.74%	0.52%
Estonia	0.42%	0.18%	**Portugal**	0.60%	0.12%
Finland	0.42%	0.08%	**Romania**	2.98%	3.40%
France	0.99%	0.18%	**Slovakia**	0.99%	0.59%
Germany	0.74%	0.25%	**Slovenia**	0.99%	0.76%
Greece	2.98%	5.10%	**Spain**	0.74%	0.61%
Hungary	1.49%	1.00%	**Sweden**	0.50%	0.13%
Ireland	0.60%	0.09%	**United Kingdom**	0.74%	0.11%

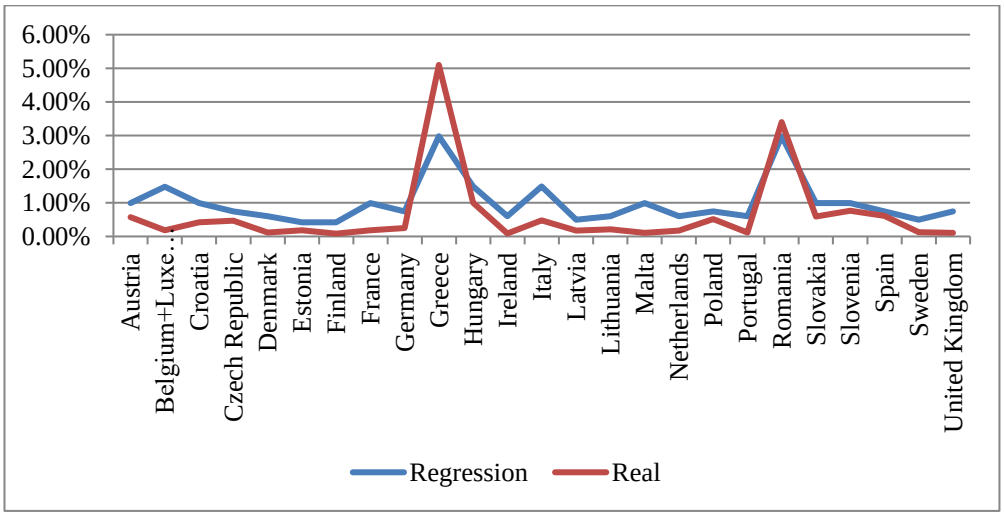

Figure 4. The relationship between exports based on distances and the real exports in 2013 in Bulgaria (in percent)

In the case of **Croatia**, from Appendix A.11 we can see that is a weak link between the two groups of indicators (R^2=0.2881), having finally:

IM_HR(t)=0.0027EX_AT(t)+0.0013EX_BE(t)+0.0018EX_BG(t)+0.0013EX_CY(t)+
0.0018EX_CZ(t)+0.0013EX_DK(t)+0.0009EX_EE(t)+0.0009EX_FI(t)+0.0018EX_FR(t)+
0.0018EX_DE(t)+0.0018EX_EL(t)+0.0053EX_HU(t)+0.0011EX_IE(t)+0.0027EX_IT(t)+0
.0011EX_LV(t)+
0.0013EX_LT(t)+0.0013EX_LU(t)+0.0018EX_MT(t)+0.0013EX_NL(t)+0.0018EX_PL(t)
+
0.0011EX_PT(t)+0.0027EX_RO(t)+0.0027EX_SK(t)+0.0053EX_SI(t)+0.0013EX_ES(t)+
0.0011EX_SE(t)+0.0013EX_UK(t)+9575.5559

A comparison of regression coefficients (even the regression isn't very good because a small value of R^2 or an existence of a weak autocorrelation) and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 4*) indicates that there are no large differences except Slovenia (figure 5) which is absolutely normal because of their former membership to Yugoslavia. Also, we can see that the real exports of EU-countries in Croatia are closer to those suggested by the regression equation which means that imports depend preferential from the potential offered by its geographic position. The average distance between real data and those from the regression is: 0.38%.

Table 4. The correlation between the coefficients of regression and the real exports of EU-countries in Croatia (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.27%	1.10%	**Italy**	0.27%	0.53%
Belgium+Luxembourg	0.26%	0.09%	**Latvia**	0.11%	0.05%
Bulgaria	0.18%	0.23%	**Lithuania**	0.13%	0.05%
Croatia	-	-	**Malta**	0.18%	0.29%
Czech Republic	0.18%	0.25%	**Netherlands**	0.13%	0.12%
Denmark	0.13%	0.25%	**Poland**	0.18%	0.24%
Estonia	0.09%	0.09%	**Portugal**	0.11%	0.03%
Finland	0.09%	0.06%	**Romania**	0.27%	0.22%
France	0.18%	0.08%	**Slovakia**	0.27%	0.43%
Germany	0.18%	0.21%	**Slovenia**	0.53%	7.20%
Greece	0.18%	0.24%	**Spain**	0.13%	0.11%
Hungary	0.53%	1.20%	**Sweden**	0.11%	0.09%
Ireland	0.11%	0.05%	**United Kingdom**	0.13%	0.04%

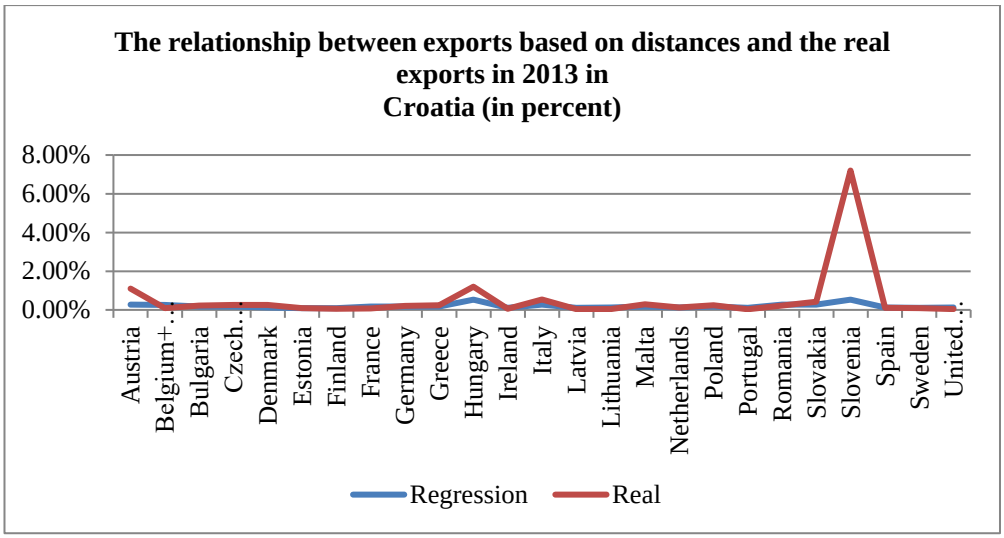

Figure 5

The case of **Cyprus**, from Appendix A.12 is not relevant because R^2=0.0071, that is the linear regression analysis does not explain the phenomenon.

In the case of **Czech Republic**, from Appendix A.13 we can see that is a strong link between the two groups of indicators (R^2=0.9451), having finally:

IM_CZ(t)=0.0599EX_AT(t)+0.0299EX_BE(t)+0.0149EX_BG(t)+0.0199EX_HR(t)+
0.0149EX_CY(t)+0.0299EX_DK(t)+0.0149EX_EE(t)+0.0149EX_FI(t)+0.0299EX_FR(t)+
0.0599EX_DE(t)+0.0199EX_EL(t)+0.0299EX_HU(t)+0.0149EX_IE(t)+0.0299EX_IT(t)+
0.0199EX_LV(t)+0.0299EX_LT(t)+0.0299EX_LU(t)+0.0199EX_MT(t)+0.0299EX_NL(t)
+
0.0599EX_PL(t)+0.0149EX_PT(t)+0.0199EX_RO(t)+0.0599EX_SK(t)+0.0299EX_SI(t)+
0.0199EX_ES(t)+0.0199EX_SE(t)+0.0199EX_UK(t)-51129.2017

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 5*) indicates that there are no large differences (real vs. predicted imports) except Slovakia (figure 6) which is absolutely normal because of their former membership to Czechoslovakia. In a contrary direction, we can see that real imports from Belgium+Luxembourg are very small (0.76%) in comparison with the distance (5.98%) and surprising the position of Germany with 2.70% in total imports of Czech Republic related to its proximity.

Also, we can see that the other real exports of EU-countries in Croatia are closer to those suggested by the regression equation which means that imports depend from the potential offered by its geographic position.

The average distance between real data and those from the regression is: 1.57%.

Table 5. The correlation between the coefficients of regression and the real exports of EU-countries in Czech Republic (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	5.99%	2.70%	**Italy**	2.99%	1.10%
Belgium+Luxembourg	5.98%	0.76%	**Latvia**	1.99%	1.10%
Bulgaria	1.49%	1.10%	**Lithuania**	2.99%	0.91%
Croatia	1.99%	1.10%	**Malta**	1.99%	0.92%
Czech Republic	-	-	**Netherlands**	2.99%	0.94%
Denmark	2.99%	0.84%	**Poland**	5.99%	5.50%
Estonia	1.49%	0.42%	**Portugal**	1.49%	0.73%
Finland	1.49%	0.49%	**Romania**	1.99%	2.10%
France	2.99%	0.82%	**Slovakia**	5.99%	11.00%
Germany	5.99%	2.70%	**Slovenia**	2.99%	2.40%
Greece	1.99%	0.63%	**Spain**	1.99%	0.81%
Hungary	2.99%	3.50%	**Sweden**	1.99%	0.83%
Ireland	1.49%	0.64%	**United Kingdom**	1.99%	0.60%

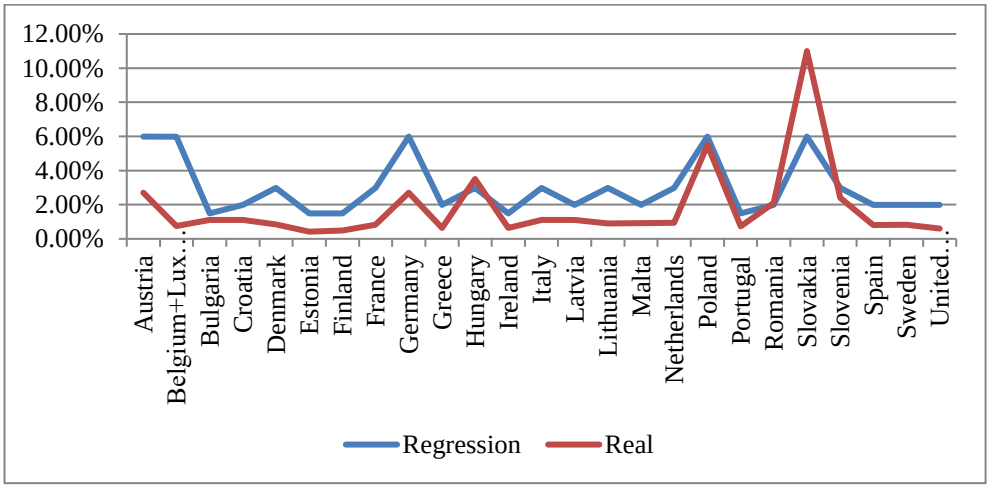

Figure 6. The relationship between exports based on distances and the real exports in 2013 in Czech Republic (in percent)

In the case of **Denmark**, from Appendix A.14 we can see that is a link between the two groups of indicators (R^2=0.7983), having:

IM_DK(t)=0.0092EX_AT(t)+0.0092EX_BE(t)+0.0037EX_BG(t)+0.0046EX_HR(t)+
0.0037EX_CY(t)+0.0092EX_CZ(t)+0.0062EX_EE(t)+0.0092EX_FI(t)+0.0092EX_FR(t)+

0.0185EX_DE(t)+0.0046EX_EL(t)+0.0062EX_HU(t)+0.0046EX_IE(t)+0.0062EX_IT(t)+
0.0046EX_LV(t)+0.0062EX_LT(t)+0.0092EX_LU(t)+0.0046EX_MT(t)+0.0092EX_NL(t)
+
0.0092EX_PL(t)+0.0046EX_PT(t)+0.0046EX_RO(t)+0.0062EX_SK(t)+0.0062EX_SI(t)+
0.0062EX_ES(t)+0.0185EX_SE(t)+0.0062EX_UK(t)+25877.4632

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.8125 for the limits of autocorrelation: (0,0.97)). However we will analyze the differences between the regression coefficients and the actual data, due to temporal delay which will appear later (when eliminating autoregression).

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 6*) indicates that there are no large differences (real vs. predicted imports) except Latvia (figure 7) and Sweden which is absolutely normal as a consequence of commercial traditions that have bound these countries.

Unlike the other countries analyzed so far, one can see that in general, real imports were above those provided by regression analysis, which shows a strong trade policy, lying over one somewhat conjectural than one dependent on proximity.

The average distance between real data and those from the regression is: 0.75%.

Table 6. The correlation between the coefficients of regression and the real exports of EU-countries in Denmark (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.92%	0.59%	**Italy**	0.62%	0.69%
Belgium+Luxembourg	1.84%	0.82%	**Latvia**	0.46%	4.30%
Bulgaria	0.37%	0.44%	**Lithuania**	0.62%	2.30%
Croatia	0.46%	0.33%	**Malta**	0.46%	0.52%
Czech Republic	0.92%	0.91%	**Netherlands**	0.92%	1.30%
Denmark	-	-	**Poland**	0.92%	1.70%
Estonia	0.62%	2.40%	**Portugal**	0.46%	0.69%
Finland	0.92%	2.00%	**Romania**	0.46%	0.43%
France	0.92%	0.55%	**Slovakia**	0.62%	1.00%
Germany	1.85%	1.40%	**Slovenia**	0.62%	1.00%
Greece	0.46%	0.50%	**Spain**	0.62%	0.51%
Hungary	0.62%	0.81%	**Sweden**	1.85%	7.10%
Ireland	0.46%	0.90%	**United Kingdom**	0.62%	1.10%

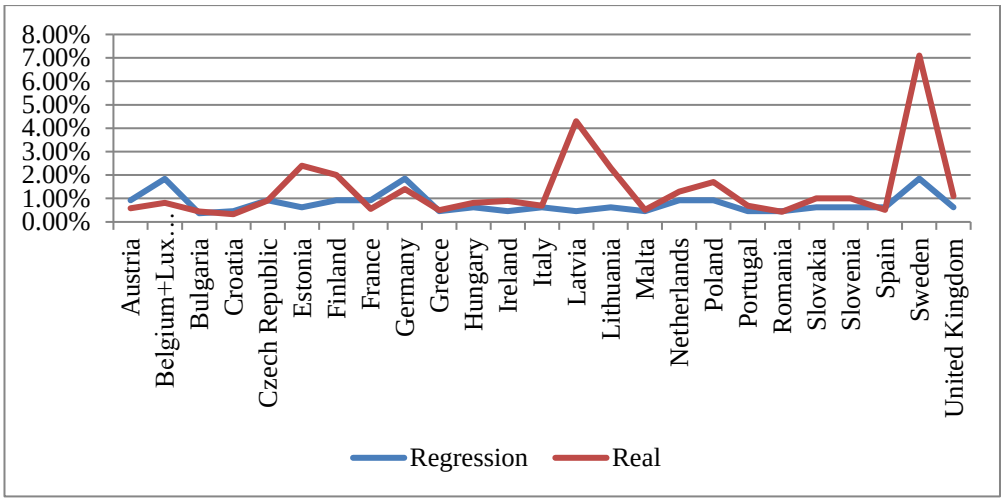

Figure 7. The relationship between exports based on distances and the real exports in 2013 in Denmark (in percent)

Because in the upper analysis we have ρ - the autocorrelation coefficient of errors having value ρ=0.579706184 we shall make another regression analysis for the set of data:

Imports-computed-new(t)=Imports-computed(t)-ρ·Imports-computed(t-1) and Exports-real-new(t)= Exports-real(t)-ρ·Exports-real(t-1) (table A.20). Finally, we obtain the equation of regression:

IM_DK(t)=0.5797IM_DK(t-1)+0.0108EX_AT(t)-0.0063EX_AT(t-1)+0.0108EX_BE(t)-0.0063EX_BE(t-1)+0.0043EX_BG(t)-0.0025EX_BG(t-1)+0.0054EX_HR(t)-0.0031EX_HR(t-1)+ 0.0043EX_CY(t)-0.0025EX_CY(t-1)+0.0108EX_CZ(t)-0.0063EX_CZ(t-1)+0.0072EX_EE(t)-0.0042EX_EE(t-1)+0.0108EX_FI(t)-0.0063EX_FI(t-1)+0.0108EX_FR(t)-0.0063EX_FR(t-1)+ 0.0216EX_DE(t)-0.0125EX_DE(t-1)+0.0054EX_EL(t)-0.0031EX_EL(t-1)+0.0072EX_HU(t)-0.0042EX_HU(t-1)+0.0054EX_IE(t)-0.0031EX_IE(t-1)+0.0072EX_IT(t)-0.0042EX_IT(t-1)+ 0.0054EX_LV(t)-0.0031EX_LV(t-1)+0.0072EX_LT(t)-0.0042EX_LT(t-1)+0.0108EX_LU(t)-0.0063EX_LU(t-1)+0.0054EX_MT(t)-0.0031EX_MT(t-1)+0.0108EX_NL(t)-0.0063EX_NL(t-1)+ 0.0108EX_PL(t)-0.0063EX_PL(t-1)+0.0054EX_PT(t)-0.0031EX_PT(t-1)+0.0054EX_RO(t)-0.0031EX_RO(t-1)+0.0072EX_SK(t)-0.0042EX_SK(t-1)+0.0072EX_SI(t)-0.0042EX_SI(t-1)+ 0.0072EX_ES(t)-0.0042EX_ES(t-1)+0.0216EX_SE(t)-0.0125EX_SE(t-1)+0.0072EX_UK(t)-0.0042EX_UK(t-1)+7957.1418

In the case of **Estonia**, from Appendix A.15 we can see that is a strong link between the two groups of indicators (R^2=0.9028), having:

IM_EE(t)=0.0036EX_AT(t)+0.0036EX_BE(t)+0.0026EX_BG(t)+0.003EX_HR(t)+0.0023 EX_CY(t)+0.0045EX_CZ(t)+0.006EX_DK(t)+0.0181EX_FI(t)+0.0036EX_FR(t)+0.0045E X_DE(t)+
0.0026EX_EL(t)+0.0036EX_HU(t)+0.0026EX_IE(t)+0.003EX_IT(t)+0.0181EX_LV(t)+ 0.009EX_LT(t)+0.0036EX_LU(t)+0.0026EX_MT(t)+0.0036EX_NL(t)+0.006EX_PL(t)+ 0.0026EX_PT(t)+0.003EX_RO(t)+0.0045EX_SK(t)+0.003EX_SI(t)+0.003EX_ES(t)+ 0.009EX_SE(t)+0.003EX_UK(t)-5844.2952

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 7*) indicates that there are no large differences (real vs. predicted imports) except former Soviet Union countries – Latvia and Lithuania (figure 8) which is absolutely normal as a consequence of commercial traditions that have bound these countries.

Let note that in general, real imports were close, but under to those provided by regression analysis, which shows a trade policy, which depends on proximity of the EU-countries but not exploring all the possibilities of the minimal distances recovery.

The average distance between real data and those from the regression is: 0.59%.

Table 7. The correlation between the coefficients of regression and the real exports of EU-countries in Estonia (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.36%	0.09%	**Italy**	0.30%	0.09%
Belgium+Luxembourg	0.72%	0.08%	**Latvia**	1.81%	7.80%
Bulgaria	0.26%	0.10%	**Lithuania**	0.90%	4.60%
Croatia	0.30%	0.38%	**Malta**	0.26%	0.03%
Czech Republic	0.45%	0.15%	**Netherlands**	0.36%	0.09%
Denmark	0.60%	0.24%	**Poland**	0.60%	0.61%
Estonia	-	-	**Portugal**	0.26%	0.06%
Finland	1.81%	2.60%	**Romania**	0.30%	0.11%
France	0.36%	0.08%	**Slovakia**	0.45%	0.12%
Germany	0.45%	0.14%	**Slovenia**	0.30%	0.14%
Greece	0.26%	0.06%	**Spain**	0.30%	0.06%
Hungary	0.36%	0.24%	**Sweden**	0.90%	0.83%
Ireland	0.26%	0.05%	**United Kingdom**	0.30%	0.17%

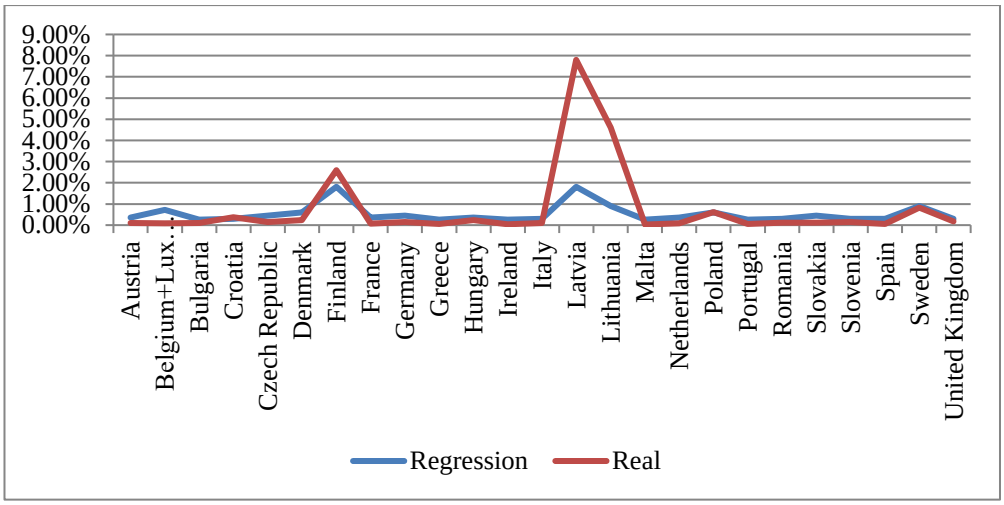

Figure 8. The relationship between exports based on distances and the real exports in 2013 in Estonia (in percent)

In the case of **Finland**, from Appendix A.16 we can see that is a weak link between the two groups of indicators (R^2=0.5906), having:

IM_FI(t)=0,0081EX_AT(t)+0,0081EX_BE(t)+0,0046EX_BG(t)+0,0054EX_HR(t)+
0,0046EX_CY(t)+0,0081EX_CZ(t)+0,0162EX_DK(t)+0,0324EX_EE(t)+0,0081EX_FR(t)
+
0,0108EX_DE(t)+0,0054EX_EL(t)+0,0065EX_HU(t)+0,0054EX_IE(t)+0,0065EX_IT(t)+
0,0162EX_LV(t)+0,0108EX_LT(t)+0,0081EX_LU(t)+0,0054EX_MT(t)+0,0081EX_NL(t)
+
0,0081EX_PL(t)+0,0054EX_PT(t)+0,0054EX_RO(t)+0,0065EX_SK(t)+0,0065EX_SI(t)+
0,0065EX_ES(t)+0,0324EX_SE(t)+0,0065EX_UK(t)+18173,0758

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 8*) indicates that there are no large differences (real vs. predicted imports) except Estonia (figure 9) with 12% real imports vs. 3.24% given by the actual theory.

In general, real imports were close, but under to those provided by regression analysis, which shows a trade policy, which depends on proximity of the EU-countries.

The average distance between real data and those from the regression is: 0.71%.

Table 8. The correlation between the coefficients of regression and the real exports of EU-countries in Finland (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.81%	0.40%	**Italy**	0.65%	0.39%
Belgium+Luxembourg	1.62%	0.52%	**Latvia**	1.62%	2.60%
Bulgaria	0.46%	0.26%	**Lithuania**	1.08%	1.60%
Croatia	0.54%	0.23%	**Malta**	0.54%	0.04%
Czech Republic	0.81%	0.53%	**Netherlands**	0.81%	0.78%
Denmark	1.62%	2.30%	**Poland**	0.81%	0.85%
Estonia	3.24%	12.00%	**Portugal**	0.54%	0.53%
Finland	-	-	**Romania**	0.54%	0.32%
France	0.81%	0.43%	**Slovakia**	0.65%	0.38%
Germany	1.08%	0.70%	**Slovenia**	0.65%	0.33%
Greece	0.54%	0.24%	**Spain**	0.65%	0.34%
Hungary	0.65%	0.30%	**Sweden**	3.24%	4.90%
Ireland	0.54%	0.43%	**United Kingdom**	0.65%	0.51%

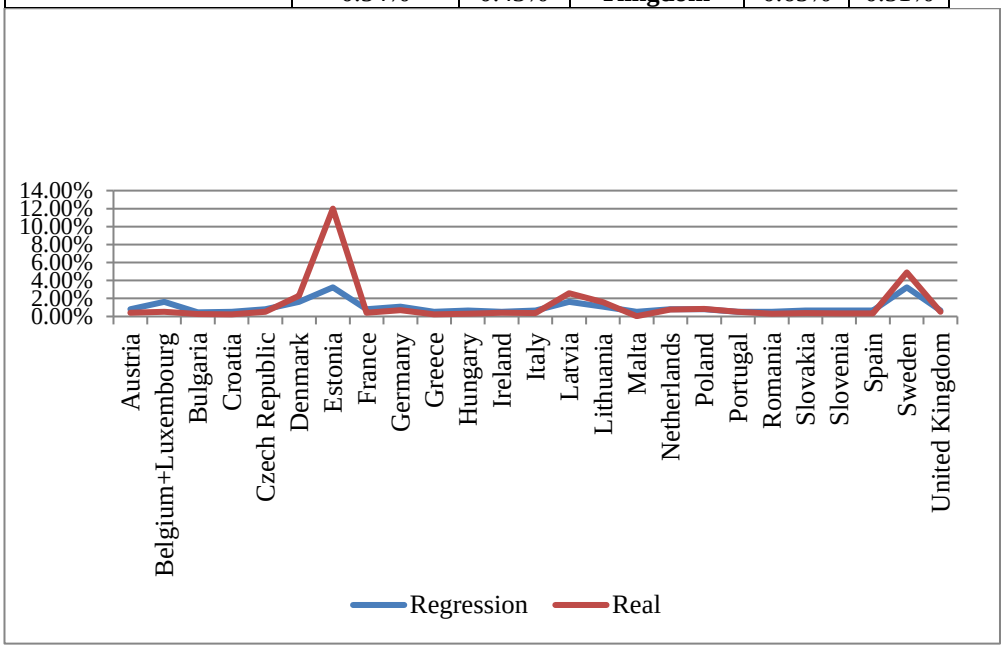

Figure 9. The relationship between exports based on distances and the real exports in 2013 in Finland (in percent)

In the case of **France**, from Appendix A.17 we can see that is a strong link between the two groups of indicators (R^2=0.9367), having:

IM_FR(t)=0.059EX_AT(t)+0.1181EX_BE(t)+0.0393EX_BG(t)+0.0393EX_HR(t)+0.0393 EX_CY(t)+0.059EX_CZ(t)+0.059EX_DK(t)+0.0236EX_EE(t)+0.0295EX_FI(t)+0.1181E X_DE(t)
+0.059EX_EL(t)+0.0393EX_HU(t)+0.059EX_IE(t)+0.1181EX_IT(t)+0.0295EX_LV(t)+ 0.0393EX_LT(t)+0.1181EX_LU(t)+0.059EX_MT(t)+0.059EX_NL(t)+0.059EX_PL(t)+ 0.059EX_PT(t)+0.0295EX_RO(t)+0.0393EX_SK(t)+0.059EX_SI(t)+0.1181EX_ES(t)+ 0.0393EX_SE(t)+0.1181EX_UK(t)+133956.0736

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 9*) indicates that there are no large differences (real vs. predicted imports) except Belgium+Luxembourg – under the distance between them and, on the other side, Romania and Portugal (figure 10) over the coefficients of regression, under traditional trade relations.

Let note that in general, real imports were close to those provided by regression analysis.

The average distance between real data and those from the regression is: 2.05%.

Table 9. The correlation between the coefficients of regression and the real exports of EU-countries in France (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	5.90%	4.40%	**Italy**	11.81%	10.00%
Belgium+Luxembourg	23.62%	14.00%	**Latvia**	2.95%	1.80%
Bulgaria	3.93%	4.50%	**Lithuania**	3.93%	3.30%
Croatia	3.93%	1.70%	**Malta**	5.90%	4.50%
Czech Republic	5.90%	5.10%	**Netherlands**	5.90%	6.20%
Denmark	5.90%	3.30%	**Poland**	5.90%	5.60%
Estonia	2.36%	1.80%	**Portugal**	5.90%	11.00%
Finland	2.95%	3.40%	**Romania**	2.95%	8.30%
France	-	-	**Slovakia**	3.93%	5.30%
Germany	11.81%	8.70%	**Slovenia**	5.90%	5.50%
Greece	5.90%	2.40%	**Spain**	11.81%	15.00%
Hungary	3.93%	4.40%	**Sweden**	3.93%	4.70%
Ireland	5.90%	6.60%	**United Kingdom**	11.81%	6.30%

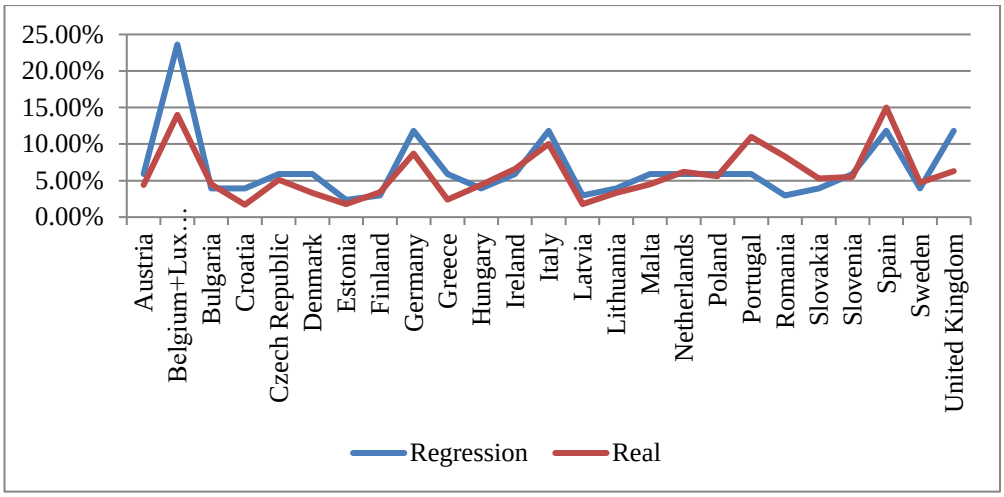

Figure 10. The relationship between exports based on distances and the real exports in 2013 in France (in percent)

In the case of **Germany**, from Appendix A.18 we can see that is a strong link between the two groups of indicators (R^2=0.9816). The P-Value Analysis reveals for Intercept a great value (0.4096) which indicates a weak evidence against the null hypothesis. In fact, assuming the threshold of 59% we obtain the regression in the table A.24. Also, we have a weak autocorrelation (d=0.8592 for the maximum 0.97) but we shall keep the initial conclusions because in the process of eliminating this phenomenon we shall obtain an increase of P-Value at 0.92 which is absurd. Therefore, finally, we have:

IM_DE(t)=0.3644EX_AT(t)+0.3644EX_BE(t)+0.091EX_BG(t)+0.1213EX_HR(t)+0.091EX_CY(t)+0.3644EX_CZ(t)+0.3644EX_DK(t)+0.091EX_EE(t)+0.1213EX_FI(t)+0.3644EX_FR(t)+
0.1213EX_EL(t)+0.1819EX_HU(t)+0.1213EX_IE(t)+0.1819EX_IT(t)+0.1213EX_LV(t)+
0.1819EX_LT(t)+0.3644EX_LU(t)+0.1213EX_MT(t)+0.3644EX_NL(t)+0.3644EX_PL(t)
+
0.1213EX_PT(t)+0.1213EX_RO(t)+0.1819EX_SK(t)+0.1819EX_SI(t)+0.1819EX_ES(t)+
0.1819EX_SE(t)+0.1819EX_UK(t)-30938.8646

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 10*) indicates that there are many differences (real vs. predicted imports) between countries - Belgium+Luxembourg with a real percent of imports of 15% instead 72.88% (after regression), Denmark with 14% vs. 36.44%, France – 15% vs. 36.44%, Netherlands – 21% vs. 36.44%, Poland – 23% vs. 36.44%. We can easily see that these difference, maybe except Poland, are encountered in the case of he very developed countries from the European Union, which have themselves a strong export. Let us note that in general, real imports were strong under to those

provided by regression analysis, Germany being known the main engine of UE. The average distance between real data and those from the regression is very high: 9.25%.

Table 10. The correlation between the coefficients of regression and the real exports of EU-countries in Germany (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	36.44%	27.00%	**Italy**	18.19%	12.00%
Belgium+Luxembourg	72.88%	15.00%	**Latvia**	12.13%	6.40%
Bulgaria	9.10%	12.00%	**Lithuania**	18.19%	7.70%
Croatia	12.13%	10.00%	**Malta**	12.13%	8.10%
Czech Republic	36.44%	29.00%	**Netherlands**	36.44%	21.00%
Denmark	36.44%	14.00%	**Poland**	36.44%	23.00%
Estonia	9.10%	3.90%	**Portugal**	12.13%	10.00%
Finland	12.13%	9.40%	**Romania**	12.13%	17.00%
France	36.44%	15.00%	**Slovakia**	18.19%	21.00%
Germany	-	-	**Slovenia**	18.19%	20.00%
Greece	12.13%	6.30%	**Spain**	18.19%	10.00%
Hungary	18.19%	25.00%	**Sweden**	18.19%	10.00%
Ireland	12.13%	7.50%	**United Kingdom**	18.19%	10.00%

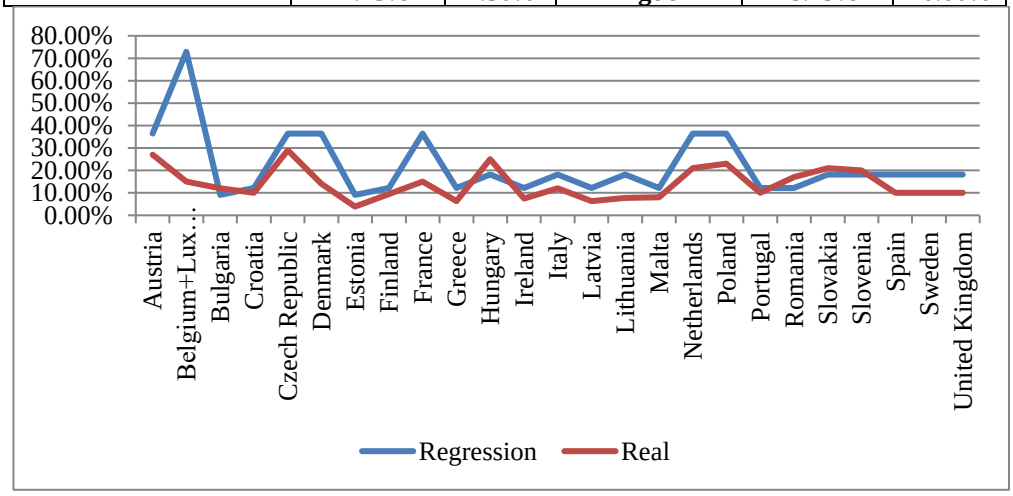

Figure 11. The relationship between exports based on distances and the real exports in 2013 in Germany (in percent)

The case of **Greece**, from Appendix A.19 is not relevant because R^2=0.0105, that is the linear regression analysis does not explain the phenomenon. Also P-Value for the dominant factor of the regression is 0.7515 that is the null hypothesis can be rejected with a very small probability (24%). In the case of **Hungary**, from Appendix A.20 we can see that is a strong link between the two groups of indicators (R^2=0.9526). The P-Value Analysis reveals for Intercept a great value (0.8302) which indicates a very weak evidence against the null hypothesis. In fact, assuming the threshold of 16% we obtain the regression in the table A.25. Therefore, finally, we have:

IM_HU(t)=0.0406EX_AT(t)+0.0135EX_BE(t)+0.0203EX_BG(t)+0.0406EX_HR(t)+ 0.0102EX_CY(t)+0.0203EX_CZ(t)+0.0135EX_DK(t)+0.0081EX_EE(t)+0.0081EX_FI(t)+ 0.0135EX_FR(t)+0.0203EX_DE(t)+0.0135EX_EL(t)+0.0081EX_IE(t)+0.0203EX_IT(t)+ 0.0102EX_LV(t)+0.0135EX_LT(t)+0.0135EX_LU(t)+0.0135EX_MT(t)+0.0135EX_NL(t)+ 0.0203EX_PL(t)+0.0081EX_PT(t)+0.0406EX_RO(t)+0.0406EX_SK(t)+0.0406EX_SI(t)+ 0.0102EX_ES(t)+0.0102EX_SE(t)+0.0102EX_UK(t)+1051.9095

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 11*) indicates that there are not great differences (real vs. predicted imports) between countries, therefore imports of Hungary are directed by territorial proximity criterion. The average distance between real data and those from the regression is: 0.75%.

Table 11. The correlation between the coefficients of regression and the real exports of EU-countries in Hungary (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	4.06%	3.50%	**Italy**	2.03%	0.84%
Belgium+Luxembourg	2.70%	0.57%	**Latvia**	1.02%	0.25%
Bulgaria	2.03%	1.20%	**Lithuania**	1.35%	0.64%
Croatia	4.06%	2.20%	**Malta**	1.35%	0.23%
Czech Republic	2.03%	2.50%	**Netherlands**	1.35%	0.66%
Denmark	1.35%	0.64%	**Poland**	2.03%	2.40%
Estonia	0.81%	0.19%	**Portugal**	0.81%	0.40%
Finland	0.81%	0.36%	**Romania**	4.06%	3.90%
France	1.35%	0.67%	**Slovakia**	4.06%	6.00%
Germany	2.03%	1.60%	**Slovenia**	4.06%	3.60%
Greece	1.35%	0.27%	**Spain**	1.02%	0.58%
Hungary	-	-	**Sweden**	1.02%	0.57%
Ireland	0.81%	0.36%	**United Kingdom**	1.02%	0.38%

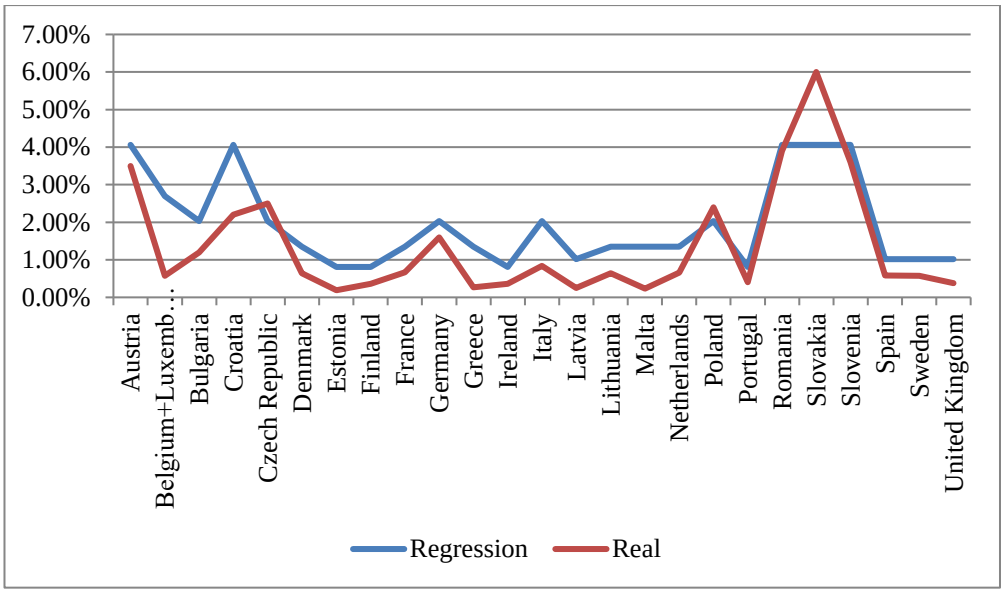

Figure 12. The relationship between exports based on distances and the real exports in 2013 in Hungary (in percent)

The case of **Ireland**, from Appendix A.21 is not relevant because R^2=0.1895, that is the linear regression analysis does not explain the phenomenon. Also P-Value for the dominant factor of the regression is 0.1572 that is the null hypothesis can be rejected with a significant probability (84%).

In the case of **Italy**, from Appendix A.22 we can see that is a weak link between the two groups of indicators (R^2=0.6116). On the other hand, P-Values Analysis reveals for both coefficients of the regression small values which indicates a strong evidence against the null hypothesis. Therefore, finally, we have:

IM_IT(t)=0.1026EX_AT(t)+0.0514EX_BE(t)+0.0514EX_BG(t)+0.0514EX_HR(t)+
0.0514EX_CY(t)+0.0514EX_CZ(t)+0.0341EX_DK(t)+0.0171EX_EE(t)+0.0205EX_FI(t)+
0.1026EX_FR(t)+0.0514EX_DE(t)+0.1026EX_EL(t)+0.0514EX_HU(t)+0.0341EX_IE(t)+
0.0205EX_LV(t)+0.0256EX_LT(t)+0.0514EX_LU(t)+0.1026EX_MT(t)+0.0341EX_NL(t)
+
0.0341EX_PL(t)+0.0341EX_PT(t)+0.0341EX_RO(t)+0.0514EX_SK(t)+0.1026EX_SI(t)+
0.0514EX_ES(t)+0.0256EX_SE(t)+0.0514EX_UK(t)+155094.5257

A comparison of regression coefficients and percentages imports from studied countries (Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 12) indicates that there are not great differences (real vs. predicted imports) between countries except cases of Croatia (14% - real vs. 5.14% - regression), Malta (3.70% - real vs. 10.26% - regression) and Romania (10% - real vs. 3.41% - regression) therefore imports of Italy are directed by territorial proximity criterion.

The average distance between real data and those from the regression is: 2.10%.

Table 12. The correlation between the coefficients of regression and the real exports of EU-countries in Italy (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	10.26%	7.10%	**Italy**	-	-
Belgium+Luxembourg	10.28%	5.40%	**Latvia**	2.05%	1.10%
Bulgaria	5.14%	10.00%	**Lithuania**	2.56%	1.80%
Croatia	5.14%	14.00%	**Malta**	10.26%	3.70%
Czech Republic	5.14%	3.70%	**Netherlands**	3.41%	5.00%
Denmark	3.41%	2.60%	**Poland**	3.41%	4.50%
Estonia	1.71%	0.86%	**Portugal**	3.41%	3.30%
Finland	2.05%	2.30%	**Romania**	3.41%	10.00%
France	10.26%	6.80%	**Slovakia**	5.14%	4.90%
Germany	5.14%	4.90%	**Slovenia**	10.26%	11.00%
Greece	10.26%	8.40%	**Spain**	5.14%	7.10%
Hungary	5.14%	5.00%	**Sweden**	2.56%	2.50%
Ireland	3.41%	2.60%	**United Kingdom**	5.14%	2.70%

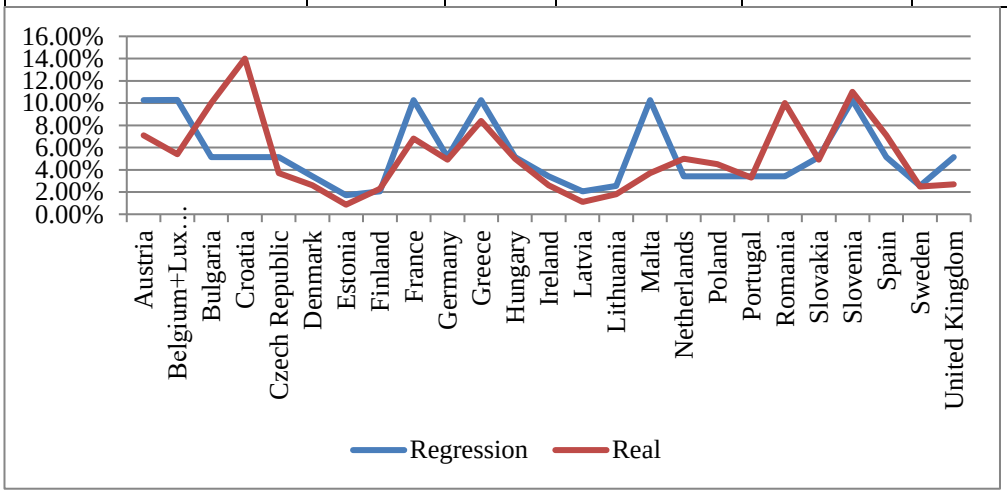

Figure 13. The relationship between exports based on distances and the real exports in 2013 in Italy (in percent)

In the case of **Latvia**, from Appendix A.23 we can see that is a strong link between the two groups of indicators (R^2=0.9299). On the other hand, P-Values Analysis reveals for both coefficients of the regression small values which indicates a strong evidence against the null hypothesis. Therefore, finally, we have:

IM_LV(t)=0.0039EX_AT(t)+0.0039EX_BE(t)+0.0026EX_BG(t)+0.0031EX_HR(t)+ 0.0022EX_CY(t)+0.0051EX_CZ(t)+0.0039EX_DK(t)+0.0155EX_EE(t)+0.0077EX_FI(t)+ 0.0039EX_FR(t)+0.0051EX_DE(t)+0.0026EX_EL(t)+0.0039EX_HU(t)+0.0026EX_IE(t)+ 0.0031EX_IT(t)+0.0155EX_LT(t)+0.0039EX_LU(t)+0.0026EX_MT(t)+0.0039EX_NL(t)+ 0.0077EX_PL(t)+0.0026EX_PT(t)+0.0031EX_RO(t)+0.0051EX_SK(t)+0.0031EX_SI(t)+ 0.0031EX_ES(t)+0.0051EX_SE(t)+0.0031EX_UK(t)-6674.8824

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 13*) indicates that there are not great differences (real vs. predicted imports) between countries except cases of close neighborhoods: Estonia (6.70% - real vs. 1.55% - regression) and Lithuania (10% - real vs. 1.55% - regression) therefore imports of Latvia are directed by territorial proximity criterion.

The average distance between real data and those from the regression is: 0.74%.

Table 13. The correlation between the coefficients of regression and the real exports of EU-countries in Latvia (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.39%	0.12%	**Italy**	0.31%	0.10%
Belgium+Luxembourg	0.78%	0.08%	**Latvia**	-	-
Bulgaria	0.26%	0.11%	**Lithuania**	1.55%	10.00%
Croatia	0.31%	0.05%	**Malta**	0.26%	0.01%
Czech Republic	0.51%	0.16%	**Netherlands**	0.39%	0.11%
Denmark	0.39%	0.34%	**Poland**	0.77%	0.76%
Estonia	1.55%	6.70%	**Portugal**	0.26%	0.04%
Finland	0.77%	0.92%	**Romania**	0.31%	0.04%
France	0.39%	0.05%	**Slovakia**	0.51%	0.23%
Germany	0.51%	0.12%	**Slovenia**	0.31%	0.17%
Greece	0.26%	0.05%	**Spain**	0.31%	0.07%
Hungary	0.39%	0.18%	**Sweden**	0.51%	0.33%
Ireland	0.26%	0.03%	**United Kingdom**	0.31%	0.09%

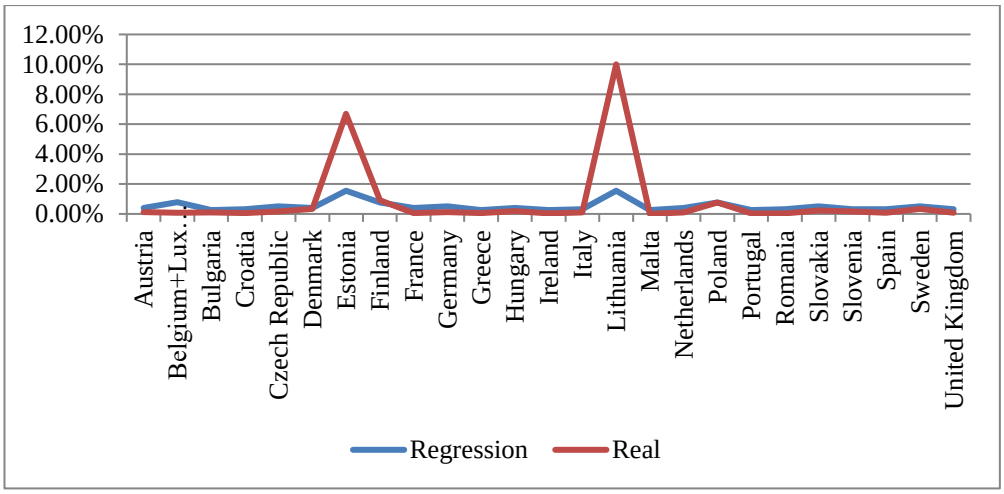

Figure 14. The relationship between exports based on distances and the real exports in 2013 in Latvia (in percent)

In the case of **Lithuania**, from Appendix A.24 we can see that is a strong link between the two groups of indicators (R^2=0.9681). On the other hand, P-Values Analysis reveals for both coefficients of the regression small values which indicates a strong evidence against the null hypothesis. Therefore, finally, we have:

IM_LT(t)=0.0079EX_AT(t)+0.0079EX_BE(t)+0.0047EX_BG(t)+0.0059EX_HR(t)+
0.0039EX_CY(t)+0.0118EX_CZ(t)+0.0079EX_DK(t)+0.0118EX_EE(t)+0.0079EX_FI(t)+
0.0079EX_FR(t)+0.0118EX_DE(t)+0.0047EX_EL(t)+0.0079EX_HU(t)+0.0047EX_IE(t)+
0.0059EX_IT(t)+0.0236EX_LV(t)+0.0079EX_LU(t)+0.0047EX_MT(t)+0.0079EX_NL(t)
+
0.0236EX_PL(t)+0.0047EX_PT(t)+0.0059EX_RO(t)+0.0118EX_SK(t)+0.0059EX_SI(t)+
0.0059EX_ES(t)+0.0059EX_SE(t)+0.0059EX_UK(t)-15820.9662

A comparison of regression coefficients and percentages imports from studied countries (Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 14) indicates that there are not great differences (real vs. predicted imports) between countries except cases of close neighborhoods: Estonia (5.10% - real vs. 1.18% - regression) and Latvia (16% - real vs. 2.36% - regression) therefore imports of Lithuania are directed by territorial proximity criterion.

The average distance between real data and those from the regression is: 1.11%.

Table 14. The correlation between the coefficients of regression and the real exports of EU-countries in Lithuania (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.79%	0.18%	**Italy**	0.59%	0.28%
Belgium+Luxembourg	1.58%	0.30%	**Latvia**	2.36%	16.00 %
Bulgaria	0.47%	0.24%	**Lithuania**	-	-
Croatia	0.59%	0.09%	**Malta**	0.47%	0.05%
Czech Republic	1.18%	0.37%	**Netherlands**	0.79%	0.33%
Denmark	0.79%	0.57%	**Poland**	2.36%	1.60%
Estonia	1.18%	5.10%	**Portugal**	0.47%	0.09%
Finland	0.79%	0.82%	**Romania**	0.59%	0.10%
France	0.79%	0.16%	**Slovakia**	1.18%	0.23%
Germany	1.18%	0.25%	**Slovenia**	0.59%	0.36%
Greece	0.47%	0.11%	**Spain**	0.59%	0.20%
Hungary	0.79%	0.27%	**Sweden**	0.59%	0.67%
Ireland	0.47%	0.06%	**United Kingdom**	0.59%	0.17%

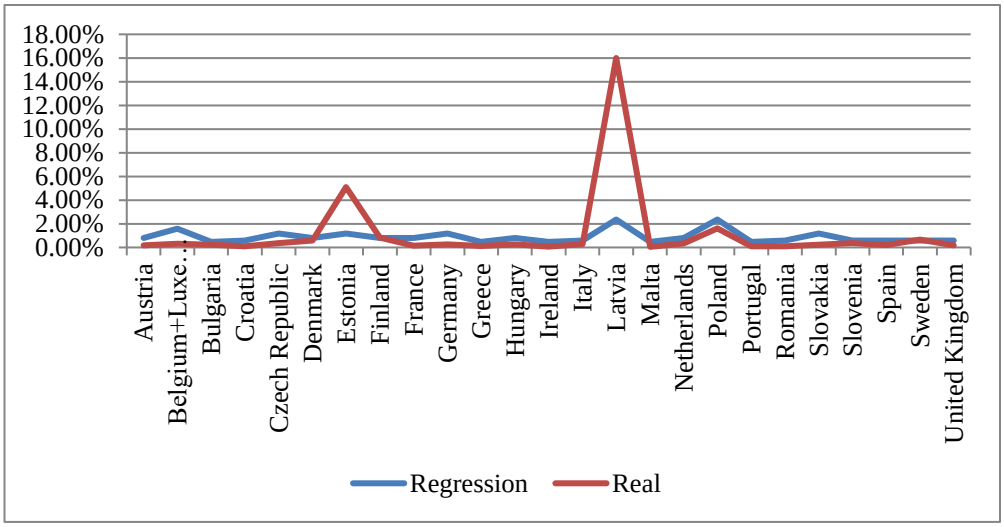

Figure 15. The relationship between exports based on distances and the real exports in 2013 in Lithuania (in percent)

In the case of **Malta**, from Appendix A.25 we can see that is a strong link between the two groups of indicators (R^2=0.8998). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.02 which indicates a strong evidence against the null hypothesis. Therefore, finally, we have:

IM_MT(t)=0.0018EX_AT(t)+0.0012EX_BE(t)+0.0012EX_BG(t)+0.0012EX_HR(t)+ 0.0012EX_CY(t)+0.0012EX_CZ(t)+0.0009EX_DK(t)+0.0005EX_EE(t)+0.0006EX_FI(t)+ 0.0018EX_FR(t)+0.0012EX_DE(t)+0.0018EX_EL(t)+0.0012EX_HU(t)+0.0009EX_IE(t)+ 0.0037EX_IT(t)+0.0006EX_LV(t)+0.0007EX_LT(t)+0.0012EX_LU(t)+0.0009EX_NL(t)+ 0.0009EX_PL(t)+0.0009EX_PT(t)+0.0009EX_RO(t)+0.0012EX_SK(t)+0.0018EX_SI(t)+ 0.0012EX_ES(t)+0.0007EX_SE(t)+0.0012EX_UK(t)-1786.1808

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 15*) indicates that there are not great differences (real vs. predicted imports) between countries except cases of close neighborhoods: Croatia (0.93% - real vs. 0.12% - regression) and Greece (0.57% - real vs. 0.18% - regression) therefore imports of Malta are directed by territorial proximity criterion.

The average distance between real data and those from the regression is: 0.11%.

Table 15. The correlation between the coefficients of regression and the real exports of EU-countries in Malta (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.18%	0.04%	**Italy**	0.37%	0.40%
Belgium+Luxembourg	0.24%	0.04%	**Latvia**	0.06%	0.03%
Bulgaria	0.12%	0.07%	**Lithuania**	0.07%	0.01%
Croatia	0.12%	0.93%	**Malta**	-	-
Czech Republic	0.12%	0.02%	**Netherlands**	0.09%	0.05%
Denmark	0.09%	0.06%	**Poland**	0.09%	0.03%
Estonia	0.05%	0.04%	**Portugal**	0.09%	0.04%
Finland	0.06%	0.01%	**Romania**	0.09%	0.06%
France	0.18%	0.14%	**Slovakia**	0.12%	0.03%
Germany	0.12%	0.03%	**Slovenia**	0.18%	0.03%
Greece	0.18%	0.57%	**Spain**	0.12%	0.08%
Hungary	0.12%	0.01%	**Sweden**	0.07%	0.15%
Ireland	0.09%	0.02%	**United Kingdom**	0.12%	0.10%

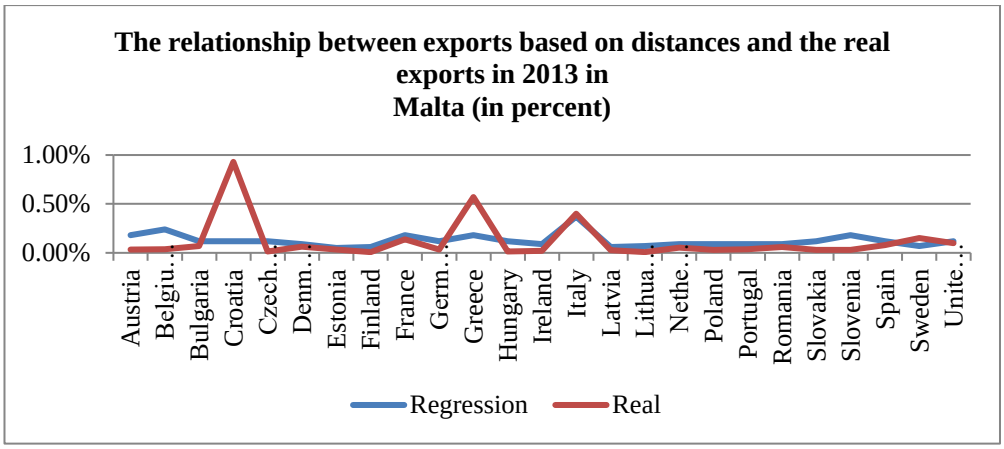

Figure 16. The relationship between exports based on distances and the real exports in 2013 in Malta (in percent)

In the case of **Netherlands**, from Appendix A.26 we can see that is a strong link between the two groups of indicators (R^2=0.9427). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.05 which indicates a strong evidence against the null hypothesis. Therefore, we have:

IM_NL(t)=0.0966EX_AT(t)+0.1931EX_BE(t)+0.0387EX_BG(t)+0.0484EX_HR(t)+ 0.0387EX_CY(t)+0.0966EX_CZ(t)+0.0966EX_DK(t)+0.0387EX_EE(t)+0.0484EX_FI(t)+ 0.0966EX_FR(t)+0.1931EX_DE(t)+0.0484EX_EL(t)+0.0644EX_HU(t)+0.0966EX_IE(t)+ 0.0644EX_IT(t)+0.0484EX_LV(t)+0.0644EX_LT(t)+0.0966EX_LU(t)+0.0484EX_MT(t)+ 0.0966EX_PL(t)+0.0484EX_PT(t)+0.0484EX_RO(t)+0.0644EX_SK(t)+0.0644EX_SI(t)+ 0.0644EX_ES(t)+0.0644EX_SE(t)+0.1931EX_UK(t)-85890.2647

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.7106 for the limits of autocorrelation: (0,0.97)). However we will analyze the differences between the regression coefficients and the actual data, due to temporal delay which will appear later (when eliminating autoregression). In this case P-Value exceeds 0.90 therefore we shall left this regression.

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 16*) indicates that there are many and large differences between real and predicted imports: Austria (1.60% vs. 9.66%), Belgium+Luxembourg (14% vs. 28.97%), Germany (2.80% vs. 19.31%), United Kingdom (7.9% vs. 19.31%) which is absolutely normal as a consequence of commercial traditions that have bound these countries.

Unlike the other countries analyzed so far, one can see that in general, real imports were under those provided by regression analysis, which shows a weak trade policy on dependence from proximity.

The average distance between real data and those from the regression is very large: 4.46%.

Table 16. The correlation between the coefficients of regression and the real exports of EU-countries in Netherlands (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	9.66%	1.60%	**Italy**	6.44%	2.30%
Belgium+Luxembourg	28.97%	14.00%	**Latvia**	4.84%	4.40%
Bulgaria	3.87%	2.40%	**Lithuania**	6.44%	3.40%
Croatia	4.84%	1.70%	**Malta**	4.84%	1.30%
Czech Republic	9.66%	3.60%	**Netherlands**	-	-
Denmark	9.66%	5.10%	**Poland**	9.66%	4.00%
Estonia	3.87%	2.30%	**Portugal**	4.84%	4.00%
Finland	4.84%	5.80%	**Romania**	4.84%	2.80%
France	9.66%	4.10%	**Slovakia**	6.44%	2.40%
Germany	19.31%	5.80%	**Slovenia**	6.44%	1.70%
Greece	4.84%	1.90%	**Spain**	6.44%	3.10%
Hungary	6.44%	2.80%	**Sweden**	6.44%	5.40%
Ireland	9.66%	4.50%	**United Kingdom**	19.31%	7.90%

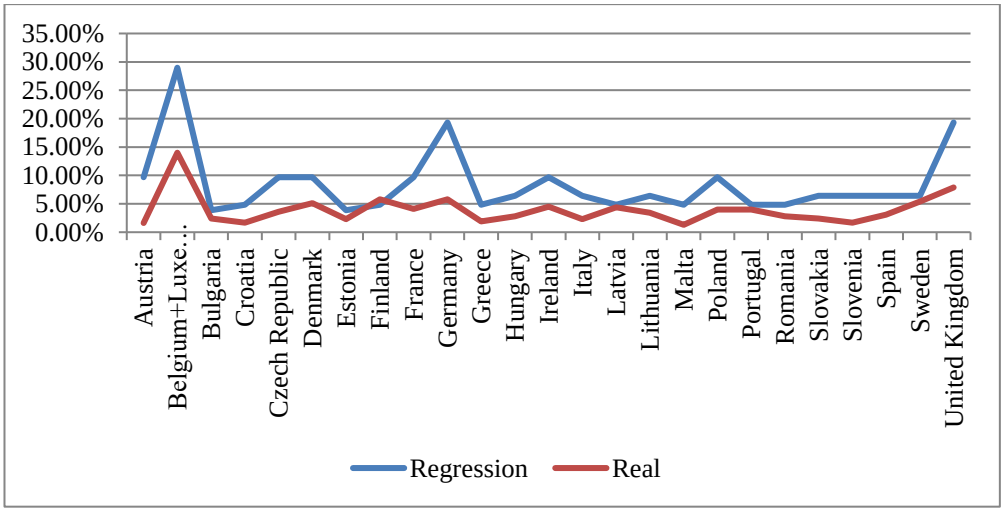

Figure 17. The relationship between exports based on distances and the real exports in 2013 in Netherlands (in percent)

In the case of **Poland**, from Appendix A.27 we can see that is a link between the two groups of indicators (R^2=0.9534), having:

IM_PL(t)=0.0473EX_AT(t)+0.0473EX_BE(t)+0.0237EX_BG(t)+0.0315EX_HR(t)+0.019 EX_CY(t)+0.0947EX_CZ(t)+0.0473EX_DK(t)+0.0315EX_EE(t)+0.0237EX_FI(t)+0.0473 EX_FR(t)+
0.0947EX_DE(t)+0.0237EX_EL(t)+0.0473EX_HU(t)+0.0237EX_IE(t)+0.0315EX_IT(t)+ 0.0473EX_LV(t)+0.0947EX_LT(t)+0.0473EX_LU(t)+0.0237EX_MT(t)+0.0473EX_NL(t) +
0.0237EX_PT(t)+0.0315EX_RO(t)+0.0947EX_SK(t)+0.0315EX_SI(t)+0.0315EX_ES(t)+ 0.0315EX_SE(t)+0.0315EX_UK(t)-84942.8966

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.7820 for the limits of autocorrelation: (0,0.97)). However we will analyze the differences between the regression coefficients and the actual data, due to temporal delay which will appear later (when eliminating autoregression).

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 17*) indicates that there are no large differences (real vs. predicted imports) except Belgium+Luxembourg (figure 18) for which real imports – 1.40% are very much under the value from regression – 9.46% and Germany – 3.3% vs. 9.47%.

For the other countries, one can see that in general, real imports were under those provided by regression analysis, which shows a trade policy based more on need and not on spatial proximity.

The average distance between real data and those from the regression is: 2.17%.

Table 17. The correlation between the coefficients of regression and the real exports of EU-countries in Poland (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	4.73%	2.20%	**Italy**	3.15%	2.20%
Belgium+Luxembourg	9.46%	1.40%	**Latvia**	4.73%	3.80%
Bulgaria	2.37%	1.80%	**Lithuania**	9.47%	5.40%
Croatia	3.15%	1.20%	**Malta**	2.37%	0.46%
Czech Republic	9.47%	5.20%	**Netherlands**	4.73%	1.50%
Denmark	4.73%	2.50%	**Poland**	-	-
Estonia	3.15%	1.20%	**Portugal**	2.37%	0.94%
Finland	2.37%	2.20%	**Romania**	3.15%	2.30%
France	4.73%	1.40%	**Slovakia**	9.47%	6.30%
Germany	9.47%	3.30%	**Slovenia**	3.15%	2.70%
Greece	2.37%	1.10%	**Spain**	3.15%	1.50%

Hungary	4.73%	3.50%	**Sweden**	3.15%	2.40%
Ireland	2.37%	1.00%	**United Kingdom**	3.15%	1.20%

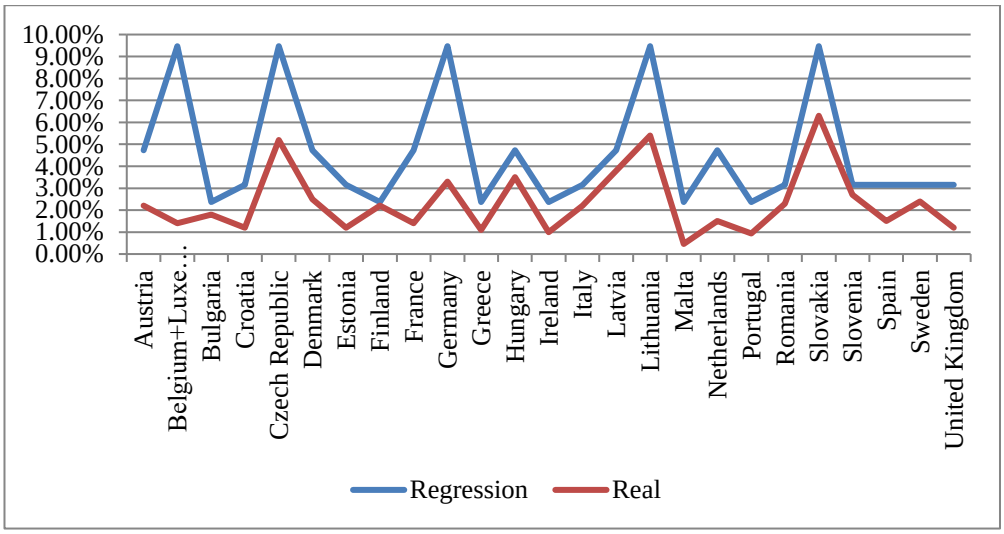

Figure 18. The relationship between exports based on distances and the real exports in 2013 in Poland (in percent)

Because in the upper analysis we have ρ - the autocorrelation coefficient of errors having value ρ=0.600743273 we shall make another regression analysis for the set of data: Imports-computed-new(t)=Imports-computed(t)-ρ·Imports-computed(t-1) and Exports-real-new(t)= Exports-real(t)-ρ·Exports-real(t-1) (table A.33). Finally, we obtain the equation of regression:

IM_PL(t)=0.6007IM_PL(t-1)+0.0404EX_AT(t)-0.0243EX_AT(t-1)+0.0404EX_BE(t)-0.0243EX_BE(t-1)+0.0202EX_BG(t)-0.0121EX_BG(t-1)+0.0269EX_HR(t)-0.0162EX_HR(t-1)+ 0.0162EX_CY(t)-0.0097EX_CY(t-1)+0.081EX_CZ(t)-0.0486EX_CZ(t-1)+0.0404EX_DK(t)-0.0243EX_DK(t-1)+0.0269EX_EE(t)-0.0162EX_EE(t-1)+0.0202EX_FI(t)-0.0121EX_FI(t-1)+ 0.0404EX_FR(t)-0.0243EX_FR(t-1)+0.081EX_DE(t)-0.0486EX_DE(t-1)+0.0202EX_EL(t)-0.0121EX_EL(t-1)+0.0404EX_HU(t)-0.0243EX_HU(t-1)+0.0202EX_IE(t)-0.0121EX_IE(t-1)+ 0.0269EX_IT(t)-0.0162EX_IT(t-1)+0.0404EX_LV(t)-0.0243EX_LV(t-1)+0.081EX_LT(t)-0.0486EX_LT(t-1)+0.0404EX_LU(t)-0.0243EX_LU(t-1)+0.0202EX_MT(t)-0.0121EX_MT(t-1)+ 0.0404EX_NL(t)-0.0243EX_NL(t-1)+0.0202EX_PT(t)-0.0121EX_PT(t-1)+0.0269EX_RO(t)-0.0162EX_RO(t-1)+0.081EX_SK(t)-0.0486EX_SK(t-1)+0.0269EX_SI(t)-0.0162EX_SI(t-1)+ 0.0269EX_ES(t)-0.0162EX_ES(t-1)+0.0269EX_SE(t)-0.0162EX_SE(t-1)+0.0269EX_UK(t)-0.0162EX_UK(t-1)-20068.4749

In the case of **Portugal**, from Appendix A.28 we can see that is a weak link between the two groups of indicators (R^2=0.5046). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.05 which indicates a strong evidence against the null hypothesis. Therefore, we have:

IM_PT(t)=0.0046EX_AT(t)+0.0062EX_BE(t)+0.0037EX_BG(t)+0.0037EX_HR(t)+ 0.0037EX_CY(t)+0.0046EX_CZ(t)+0.0046EX_DK(t)+0.0027EX_EE(t)+0.0031EX_FI(t)+ 0.0093EX_FR(t)+0.0062EX_DE(t)+0.0046EX_EL(t)+0.0037EX_HU(t)+0.0046EX_IE(t)+ 0.0062EX_IT(t)+0.0031EX_LV(t)+0.0037EX_LT(t)+0.0062EX_LU(t)+0.0046EX_MT(t)+ 0.0046EX_NL(t)+0.0046EX_PL(t)+0.0031EX_RO(t)+0.0037EX_SK(t)+0.0046EX_SI(t)+ 0.0186EX_ES(t)+0.0037EX_SE(t)+0.0062EX_UK(t)+30732.5842

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 18*) indicates that there are no large differences between real and predicted imports except the traditional partner Spain – 6.90% vs. 1.86%) which is absolutely normal as a consequence of commercial traditions that have bound these countries. In general, real imports are very close to those provided by regression analysis, which shows a strong trade policy on dependence from proximity. The average distance between real data and those from the regression is small: 0.34%.

Table 18. The correlation between the coefficients of regression and the real exports of EU-countries in Portugal (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	0.46%	0.22%	**Italy**	0.62%	0.76%
Belgium+Luxembourg	1.24%	0.42%	**Latvia**	0.31%	0.07%
Bulgaria	0.37%	0.70%	**Lithuania**	0.37%	0.29%
Croatia	0.37%	0.14%	**Malta**	0.46%	0.28%
Czech Republic	0.46%	0.30%	**Netherlands**	0.46%	0.49%
Denmark	0.46%	0.32%	**Poland**	0.46%	0.34%
Estonia	0.27%	0.15%	**Portugal**	-	-
Finland	0.31%	0.27%	**Romania**	0.31%	0.36%
France	0.93%	0.84%	**Slovakia**	0.37%	0.27%
Germany	0.62%	0.57%	**Slovenia**	0.46%	0.24%
Greece	0.46%	0.50%	**Spain**	1.86%	6.90%
Hungary	0.37%	0.28%	**Sweden**	0.37%	0.34%
Ireland	0.46%	0.54%	**United Kingdom**	0.62%	0.45%

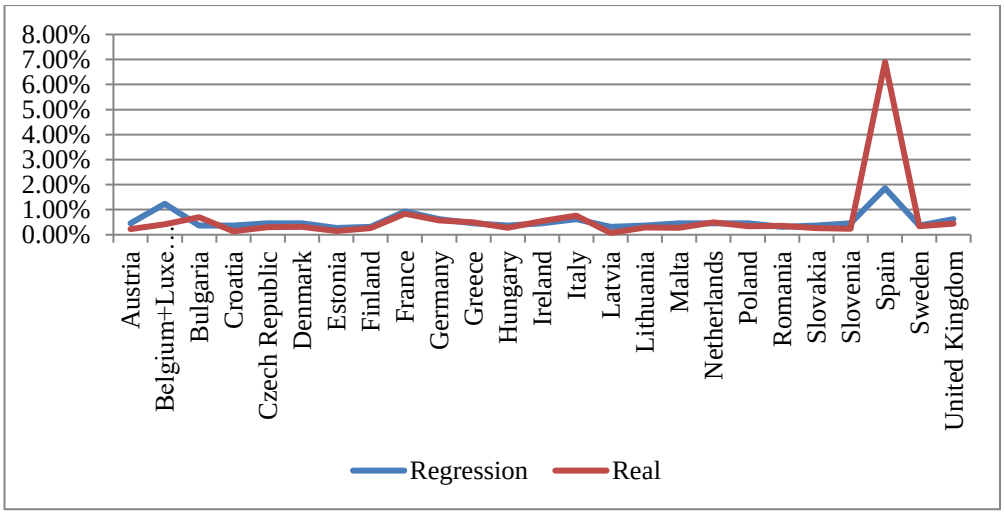

Figure 19. The relationship between exports based on distances and the real exports in 2013 in Portugal (in percent)

In the case of **Romania**, from Appendix A.29 we can see that is a strong link between the two groups of indicators (R^2=0.9088), having:

IM_RO(t)=0.029EX_AT(t)+0.0145EX_BE(t)+0.0581EX_BG(t)+0.029EX_HR(t)+0.0193EX_CY(t)+0.0193EX_CZ(t)+0.0145EX_DK(t)+0.0097EX_EE(t)+0.0097EX_FI(t)+0.0145EX_FR(t)+
0.0193EX_DE(t)+0.029EX_EL(t)+0.0581EX_HU(t)+0.0097EX_IE(t)+0.0193EX_IT(t)+
0.0116EX_LV(t)+0.0145EX_LT(t)+0.0145EX_LU(t)+0.0145EX_MT(t)+0.0145EX_NL(t)+
0.0193EX_PL(t)+0.0097EX_PT(t)+0.029EX_SK(t)+0.029EX_SI(t)+0.0116EX_ES(t)+
0.0116EX_SE(t)+0.0116EX_UK(t)-20819.1367

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.7055 for the limits of autocorrelation: (0,0.97)). However we will analyze the differences between the regression coefficients and the actual data, due to temporal delay which will appear later (when eliminating autoregression).

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 19)* indicates that there are no large differences (real vs. predicted imports) from where one can see that in general, real imports are close to those provided by regression analysis, which shows a trade policy based almost entirely on spatial proximity.

The average distance between real data and those from the regression is: 0.84%

Table 19. The correlation between the coefficients of regression and the real exports of EU-countries in Romania (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	2.90%	1.70%	**Italy**	1.93%	1.50%
Belgium+Luxembourg	2.90%	0.42%	**Latvia**	1.16%	0.17%
Bulgaria	5.81%	6.60%	**Lithuania**	1.45%	0.30%
Croatia	2.90%	0.91%	**Malta**	1.45%	0.86%
Czech Republic	1.93%	1.30%	**Netherlands**	1.45%	0.48%
Denmark	1.45%	0.58%	**Poland**	1.93%	1.60%
Estonia	0.97%	0.10%	**Portugal**	0.97%	0.60%
Finland	0.97%	0.25%	**Romania**	-	-
France	1.45%	0.73%	**Slovakia**	2.90%	2.20%
Germany	1.93%	0.93%	**Slovenia**	2.90%	1.50%
Greece	2.90%	2.20%	**Spain**	1.16%	0.58%
Hungary	5.81%	5.70%	**Sweden**	1.16%	0.24%
Ireland	0.97%	0.38%	**United Kingdom**	1.16%	0.35%

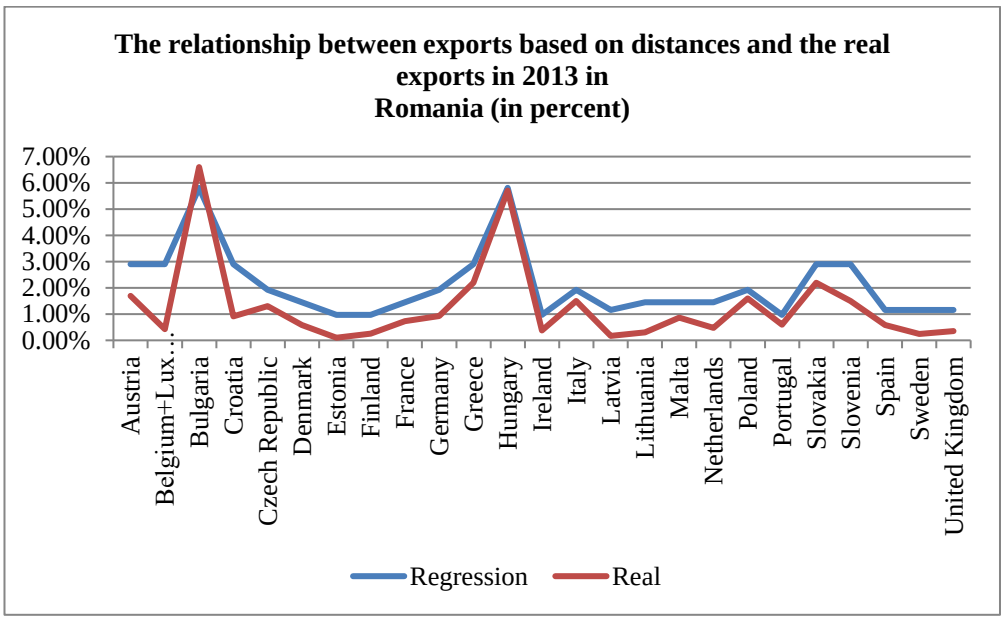

Figure 20. The relationship between exports based on distances and the real exports in 2013 in Romania (in percent)

Because in the upper analysis we have ρ - the autocorrelation coefficient of errors having value ρ=0.625714756 we shall make another regression analysis for the set of data: Imports-computed-new(t)=Imports-computed(t)-ρ·Imports-computed(t-1) and Exports-real-new(t)= Exports-real(t)-ρ·Exports-real(t-1) (table A.36). Finally, we obtain the equation of regression:

IM_RO(t)=0.6257IM_RO(t-1)+0.0305EX_AT(t)-0.0191EX_AT(t-1)+0.0152EX_BE(t)-0.0095EX_BE(t-1)+0.061EX_BG(t)-0.0382EX_BG(t-1)+0.0305EX_HR(t)-0.0191EX_HR(t-1)+ 0.0203EX_CY(t)-0.0127EX_CY(t-1)+0.0203EX_CZ(t)-0.0127EX_CZ(t-1)+0.0152EX_DK(t)-0.0095EX_DK(t-1)+0.0102EX_EE(t)-0.0064EX_EE(t-1)+0.0102EX_FI(t)-0.0064EX_FI(t-1)+ 0.0152EX_FR(t)-0.0095EX_FR(t-1)+0.0203EX_DE(t)-0.0127EX_DE(t-1)+0.0305EX_EL(t)-0.0191EX_EL(t-1)+0.061EX_HU(t)-0.0382EX_HU(t-1)+0.0102EX_IE(t)-0.0064EX_IE(t-1)+ 0.0203EX_IT(t)-0.0127EX_IT(t-1)+0.0122EX_LV(t)-0.0076EX_LV(t-1)+0.0152EX_LT(t)-0.0095EX_LT(t-1)+0.0152EX_LU(t)-0.0095EX_LU(t-1)+0.0152EX_MT(t)-0.0095EX_MT(t-1)+ 0.0152EX_NL(t)-0.0095EX_NL(t-1)+0.0203EX_PL(t)-0.0127EX_PL(t-1)+0.0102EX_PT(t)-0.0064EX_PT(t-1)+0.0305EX_SK(t)-0.0191EX_SK(t-1)+0.0305EX_SI(t)-0.0191EX_SI(t-1)+ 0.0122EX_ES(t)-0.0076EX_ES(t-1)+0.0122EX_SE(t)-0.0076EX_SE(t-1)+0.0122EX_UK(t)-0.0076EX_UK(t-1)-8887.5794

In the case of **Slovakia**, from Appendix A.30 we can see that is a strong link between the two groups of indicators (R^2=0.9606). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.05 which indicates a strong evidence against the null hypothesis. Therefore, we have:

IM_SK(t)=0.0486EX_AT(t)+0.0162EX_BE(t)+0.0162EX_BG(t)+0.0243EX_HR(t)+ 0.0122EX_CY(t)+0.0486EX_CZ(t)+0.0162EX_DK(t)+0.0122EX_EE(t)+0.0097EX_FI(t)+ 0.0162EX_FR(t)+0.0243EX_DE(t)+0.0162EX_EL(t)+0.0486EX_HU(t)+0.0097EX_IE(t)+ 0.0243EX_IT(t)+0.0162EX_LV(t)+0.0243EX_LT(t)+0.0162EX_LU(t)+0.0162EX_MT(t)+ 0.0162EX_NL(t)+0.0486EX_PL(t)+0.0097EX_PT(t)+0.0243EX_RO(t)+0.0243EX_SI(t)+ 0.0122EX_ES(t)+0.0122EX_SE(t)+0.0122EX_UK(t)-36725.8702

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 20*) indicates that there are no large differences between real and predicted imports except formerly part of Czechoslovakia: Czech Republic – 7.60% vs. 4.86% which is absolutely normal as a consequence of commercial traditions that have bound these countries.

In general, real imports are under to those provided by regression analysis, which shows an insufficient correlation of imports with distances.

The average distance between real data and those from the regression is small: 1.36%.

Table 20. The correlation between the coefficients of regression and the real exports of EU-countries in Slovakia (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	4.86%	1.50%	**Italy**	2.43%	0.57%
Belgium+Luxembourg	3.24%	0.26%	**Latvia**	1.62%	0.52%
Bulgaria	1.62%	0.71%	**Lithuania**	2.43%	0.31%
Croatia	2.43%	1.30%	**Malta**	1.62%	0.10%
Czech Republic	4.86%	7.60%	**Netherlands**	1.62%	0.21%
Denmark	1.62%	0.30%	**Poland**	4.86%	2.30%
Estonia	1.22%	0.34%	**Portugal**	0.97%	0.25%
Finland	0.97%	0.20%	**Romania**	2.43%	1.50%
France	1.62%	0.45%	**Slovakia**	-	-
Germany	2.43%	0.96%	**Slovenia**	2.43%	1.70%
Greece	1.62%	0.28%	**Spain**	1.22%	0.32%
Hungary	4.86%	4.20%	**Sweden**	1.22%	0.23%
Ireland	0.97%	0.16%	**United Kingdom**	1.22%	0.20%

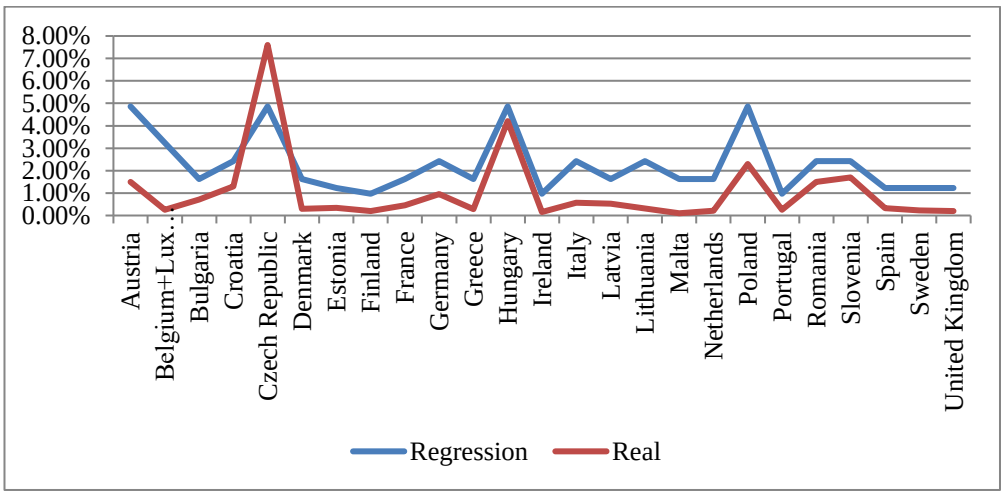

Figure 21. The relationship between exports based on distances and the real exports in 2013 in Slovakia (in percent)

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.7802 for the limits of autocorrelation: (0,0.97)). Because in the analysis we have ρ - the autocorrelation coefficient of errors having value ρ=0.595858587 we made another regression analysis for the set of data: Imports-computed-

new(t)=Imports-computed(t)-ρ·Imports-computed(t-1) and Exports-real-new(t)= Exports-real(t)-ρ·Exports-real(t-1). Finally, we obtained again a positive autocorrelation of errors (d=0.8278 for the limits of autocorrelation: (0,0.93)) and a value of R^2 less than before. As a consequence we shall let the previous results as model of imports.

In the case of **Slovenia**, from Appendix A.31 we can see that is a strong link between the two groups of indicators (R^2=0.8982), having:

IM_SI(t)=0.0138EX_AT(t)+0.0046EX_BE(t)+0.0046EX_BG(t)+0.0138EX_HR(t)+
0.0046EX_CY(t)+0.0069EX_CZ(t)+0.0046EX_DK(t)+0.0023EX_EE(t)+0.0028EX_FI(t)+
0.0069EX_FR(t)+0.0069EX_DE(t)+0.0069EX_EL(t)+0.0138EX_HU(t)+0.0034EX_IE(t)+
0.0138EX_IT(t)+0.0028EX_LV(t)+0.0034EX_LT(t)+0.0046EX_LU(t)+0.0069EX_MT(t)+
0.0046EX_NL(t)+0.0046EX_PL(t)+0.0034EX_PT(t)+0.0069EX_RO(t)+0.0069EX_SK(t)+

0.0046EX_ES(t)+0.0034EX_SE(t)+0.0046EX_UK(t)-4295.3188

Durbin Watson statistical analysis reveals a positive autocorrelation of errors (d=0.5058 for the limits of autocorrelation: (0,0.97)). However we will analyze the differences between the regression coefficients and the actual data, due to temporal delay which will appear later (when eliminating autoregression).

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 21*) indicates that there are no large differences (real vs. predicted imports) except Croatia (which were a part from the former Yugoslavia from where one can see that in general, real imports are close to those provided by regression analysis, which shows a trade policy based almost entirely on spatial proximity.

The average distance between real data and those from the regression is: 0.57 %

Table 21. The correlation between the coefficients of regression and the real exports of EU-countries in Slovenia (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	1.38%	1.50%	**Italy**	1.38%	0.90%
Belgium+Luxembourg	0.92%	0.13%	**Latvia**	0.28%	0.11%
Bulgaria	0.46%	0.41%	**Lithuania**	0.34%	0.17%
Croatia	1.38%	9.50%	**Malta**	0.69%	0.22%
Czech Republic	0.69%	0.45%	**Netherlands**	0.46%	0.11%
Denmark	0.46%	0.09%	**Poland**	0.46%	0.36%
Estonia	0.23%	0.07%	**Portugal**	0.34%	0.22%
Finland	0.28%	0.10%	**Romania**	0.69%	0.41%
France	0.69%	0.22%	**Slovakia**	0.69%	0.58%
Germany	0.69%	0.35%	**Slovenia**	-	-

Greece	0.69%	0.54%	**Spain**	0.46%	0.20%
Hungary	1.38%	0.97%	**Sweden**	0.34%	0.12%
Ireland	0.34%	0.06%	**United Kingdom**	0.46%	0.09%

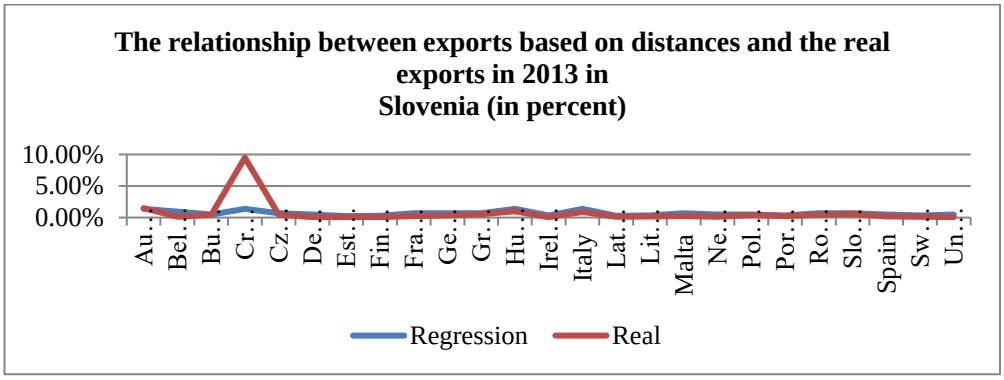

Figure 22. The relationship between exports based on distances and the real exports in 2013 in Slovenia (in percent)

Because in the upper analysis we have ρ - the autocorrelation coefficient of errors having value ρ=0,715462436 we shall make another regression analysis for the set of data:

Imports-computed-new(t)=Imports-computed(t)-ρ·Imports-computed(t-1) and Exports-real-new(t)= Exports-real(t)-ρ·Exports-real(t-1) (table A.39). Finally, we obtain the equation of regression:

IM_SI(t)=0.7155IM_SI(t-1)+0.014EX_AT(t)-0.01EX_AT(t-1)+0.0047EX_BE(t)-0.0033EX_BE(t-1)+ 0.0047EX_BG(t)-0.0033EX_BG(t-1)+0.014EX_HR(t)-0.01EX_HR(t-1)+0.0047EX_CY(t)-0.0033EX_CY(t-1)+0.007EX_CZ(t)-0.005EX_CZ(t-1)+0.0047EX_DK(t)-0.0033EX_DK(t-1)+ 0.0023EX_EE(t)-0.0017EX_EE(t-1)+0.0028EX_FI(t)-0.002EX_FI(t-1)+0.007EX_FR(t)-0.005EX_FR(t-1)+0.007EX_DE(t)-0.005EX_DE(t-1)+0.007EX_EL(t)-0.005EX_EL(t-1)+ 0.014EX_HU(t)-0.01EX_HU(t-1)+0.0035EX_IE(t)-0.0025EX_IE(t-1)+0.014EX_IT(t)-0.01EX_IT(t-1)+0.0028EX_LV(t)-0.002EX_LV(t-1)+0.0035EX_LT(t)-0.0025EX_LT(t-1)+ 0.0047EX_LU(t)-0.0033EX_LU(t-1)+0.007EX_MT(t)-0.005EX_MT(t-1)+0.0047EX_NL(t)-0.0033EX_NL(t-1)+0.0047EX_PL(t)-0.0033EX_PL(t-1)+0.0035EX_PT(t)-0.0025EX_PT(t-1)+ 0.007EX_RO(t)-0.005EX_RO(t-1)+0.007EX_SK(t)-0.005EX_SK(t-1)+0.0047EX_ES(t)-0.0033EX_ES(t-1)+0.0035EX_SE(t)-0.0025EX_SE(t-1)+0.0047EX_UK(t)-0.0033EX_UK(t-1)-1281.1717

In the case of **Spain**, from Appendix A.32 we can see that is a weak link between the two groups of indicators (R^2=0.6000). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.05 which indicates a strong evidence against the null hypothesis. Therefore, we have:

IM_ES(t)=0.0273EX_AT(t)+0.041EX_BE(t)+0.0205EX_BG(t)+0.0205EX_HR(t)+0.0205 EX_CY(t)+0.0273EX_CZ(t)+0.0273EX_DK(t)+0.0137EX_EE(t)+0.0164EX_FI(t)+0.082EX_FR(t)+
0.041EX_DE(t)+0.0273EX_EL(t)+0.0205EX_HU(t)+0.0273EX_IE(t)+0.041EX_IT(t)+
0.0164EX_LV(t)+0.0205EX_LT(t)+0.041EX_LU(t)+0.0273EX_MT(t)+0.0273EX_NL(t)+
0.0273EX_PL(t)+0.082EX_PT(t)+0.0164EX_RO(t)+0.0205EX_SK(t)+0.0273EX_SI(t)
+0.0205EX_SE(t)+0.041EX_UK(t)+102990.7901

A comparison of regression coefficients and percentages imports from studied countries (*Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 22*) indicates that there are no large differences between real and predicted imports except the traditional partner Portugal – 21% vs. 8.20%) which is absolutely normal as a consequence of commercial traditions that have bound these countries and also Belgium+Luxembourg (2.40% vs. 8.20%). In general, real imports are very close to those provided by regression analysis, which shows a strong trade policy on dependence from proximity. The average distance between real data and those from the regression is small: 1.42%.

Table 22. The correlation between the coefficients of regression and the real exports of EU-countries in Spain (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	2.73%	1.40%	**Italy**	4.10%	4.00%
Belgium+Luxembourg	8.20%	2.40%	**Latvia**	1.64%	0.54%
Bulgaria	2.05%	2.30%	**Lithuania**	2.05%	0.97%
Croatia	2.05%	0.60%	**Malta**	2.73%	1.10%
Czech Republic	2.73%	2.30%	**Netherlands**	2.73%	2.40%
Denmark	2.73%	1.70%	**Poland**	2.73%	2.30%
Estonia	1.37%	0.60%	**Portugal**	8.20%	21.00%
Finland	1.64%	1.40%	**Romania**	1.64%	2.20%
France	8.20%	5.90%	**Slovakia**	2.05%	2.20%
Germany	4.10%	2.70%	**Slovenia**	2.73%	1.20%
Greece	2.73%	3.10%	**Spain**	-	-
Hungary	2.05%	2.40%	**Sweden**	2.05%	1.90%
Ireland	2.73%	2.80%	**United Kingdom**	4.10%	2.90%

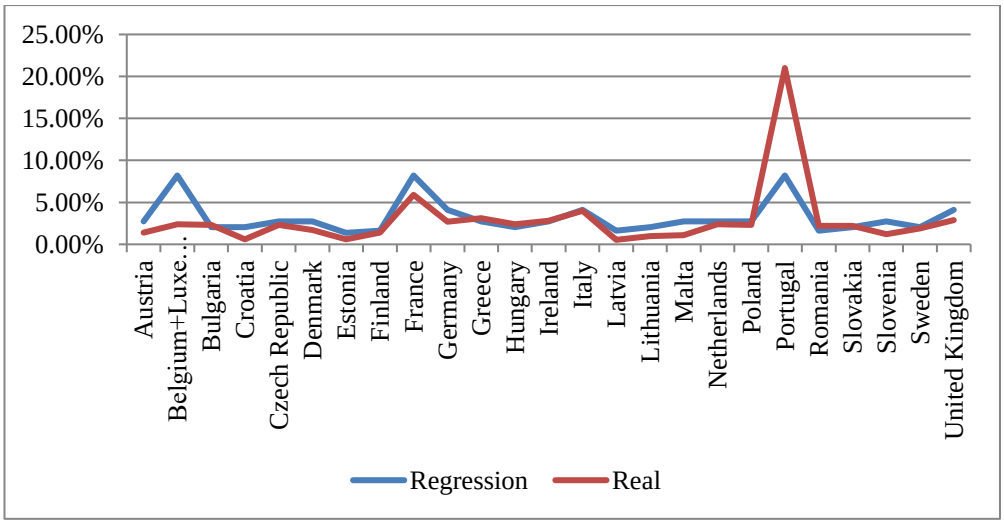

Figure 23. The relationship between exports based on distances and the real exports in 2013 in Spain (in percent)

The case of **Sweden**, from Appendix A.33 is not relevant because even R^2=0.9135, P-Value for Intercept 0.9126 that is the null hypothesis can be rejected with a very small probability (8%).

In the case of **United Kingdom**, from Appendix A.34 we can see that is a weak link between the two groups of indicators (R^2=0.4452). On the other hand, P-Values Analysis reveals for both coefficients of the regression values under 0.05 which indicates a strong evidence against the null hypothesis. Therefore, we have:

IM_UK(t)=0.0373EX_AT(t)+0.1118EX_BE(t)+0.028EX_BG(t)+0.028EX_HR(t)+0.028EX_CY(t)+
0.0373EX_CZ(t)+0.0373EX_DK(t)+0.0186EX_EE(t)+0.0224EX_FI(t)+0.1118EX_FR(t)+
0.0559EX_DE(t)+0.0373EX_EL(t)+0.028EX_HU(t)+0.1118EX_IE(t)+0.0559EX_IT(t)+
0.0224EX_LV(t)+0.028EX_LT(t)+0.0559EX_LU(t)+0.0373EX_MT(t)+0.1118EX_NL(t)+
0.0373EX_PL(t)+0.0373EX_PT(t)+0.0224EX_RO(t)+0.028EX_SK(t)+0.0373EX_SI(t)+

0.0559EX_ES(t)+0.028EX_SE(t)+202675.6936

A comparison of regression coefficients and percentages imports from studied countries (Source: http://atlas.media.mit.edu/en/profile/country - column Real in Table 23) indicates that there are no large differences between real and predicted imports except Belgium+Luxembourg (8.40% vs. 16.77%), Denmark (8.70% vs. 3.73%), France (6.90% vs. 11.18%) and Sweden (7% vs. 2.80%).

In general, real imports are over those provided by regression analysis, which shows a trade policy dependents weak from proximity.

The average distance between real data and those from the regression is small: 2.09%.

Table 23. The correlation between the coefficients of regression and the real exports of EU-countries in United Kingdom (in percent) in 2013

Country	Regression	Real	Country	Regression	Real
Austria	3.73%	2.80%	**Italy**	5.59%	5.00%
Belgium+Luxembourg	16.77%	8.40%	**Latvia**	2.24%	5.70%
Bulgaria	2.80%	2.20%	**Lithuania**	2.80%	5.20%
Croatia	2.80%	1.80%	**Malta**	3.73%	2.30%
Czech Republic	3.73%	4.90%	**Netherlands**	11.18%	9.70%
Denmark	3.73%	8.70%	**Poland**	3.73%	6.50%
Estonia	1.86%	2.50%	**Portugal**	3.73%	4.90%
Finland	2.24%	5.00%	**Romania**	2.24%	3.50%
France	11.18%	6.90%	**Slovakia**	2.80%	4.90%
Germany	5.59%	6.40%	**Slovenia**	3.73%	1.90%
Greece	3.73%	3.40%	**Spain**	5.59%	7.20%
Hungary	2.80%	4.20%	**Sweden**	2.80%	7.00%
Ireland	11.18%	14.00%	**United Kingdom**	-	-

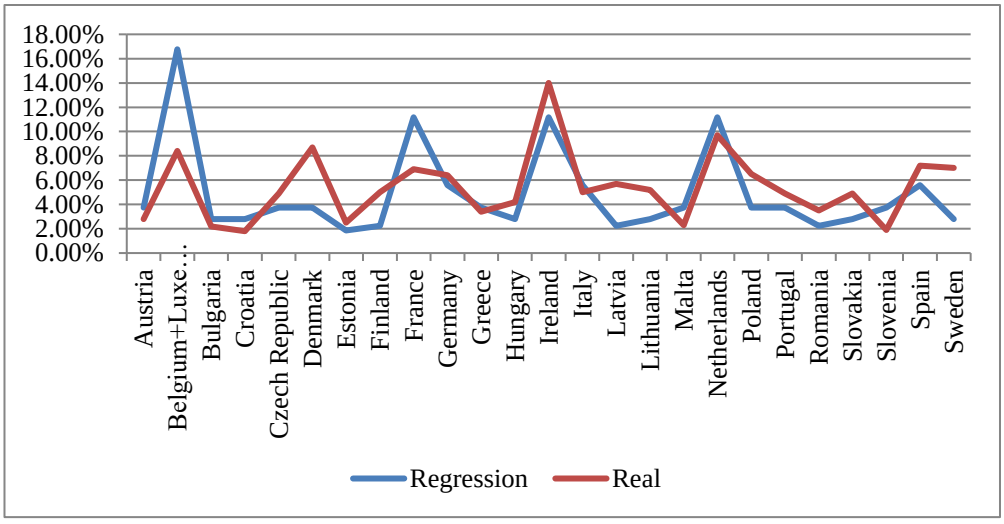

Figure 24. The relationship between exports based on distances and the real exports in 2013 in Spain (in percent)

4. Conclusions

The above analysis reveals a number of interesting issues. Overall, imports of countries that have recently joined the European Union heavily dependent on factor space which shows a certain amateurism in foreign trade, sprang but also from the weak purchasing countries receivers making imports to be dependent distances, and therefore lower costs.

On the other hand, the highly developed countries of the European Union have long commercial tradition which explains, in most cases, major differences compared to the theoretical results.

Another factor, again demonstrated numerically, is still the tight dependencies between countries that belonged to the now dismantled some states (such as the former Yugoslavia or Czechoslovakia).

5. References

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Appendix A.1

Table A.1. The matrix of the graph of edges between European Union countries ([2])

Country	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
01	0	∞	∞	∞	∞	1	∞	∞	∞	∞	1	∞	1	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	1	1	∞	∞	∞
02	∞	0	∞	∞	∞	∞	∞	∞	∞	1	1	∞	∞	∞	∞	∞	∞	1	∞	1	∞	∞	∞	∞	∞	∞	∞	1
03	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞
04	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞
05	∞	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
06	1	∞	∞	∞	∞	0	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	1	∞	∞	∞	∞
07	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞
08	∞	∞	∞	∞	∞	∞	∞	0	1	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
09	∞	∞	∞	∞	∞	∞	∞	1	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞
10	∞	1	∞	∞	∞	∞	∞	∞	∞	0	1	∞	∞	∞	1	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	1	∞	1
11	1	1	∞	∞	∞	1	1	∞	∞	1	0	∞	∞	∞	∞	∞	∞	1	∞	1	1	∞	∞	∞	∞	∞	∞	∞
12	∞	∞	1	∞	1	∞	∞	∞	∞	∞	∞	0	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
13	1	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	1	1	∞	∞	∞
14	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1
15	1	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	1	∞	∞	0	∞	∞	∞	1	∞	∞	∞	∞	∞	1	∞	∞	∞
16	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	0	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
17	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	0	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞
18	∞	1	∞	∞	∞	∞	∞	∞	∞	1	1	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
19	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	∞	∞
20	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	∞	∞	∞	∞	1
21	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	1	∞	∞	∞	0	∞	∞	1	∞	∞	∞	∞

22	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	1	∞	∞
23	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞	∞	∞
24	1	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	0	∞	∞	∞	∞
25	1	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	∞	∞	∞
26	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	0	∞	∞
27	∞	∞	∞	∞	∞	∞	1	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	0	∞
28	∞	1	∞	∞	∞	∞	∞	∞	∞	1	∞	∞	∞	1	∞	∞	∞	∞	∞	1	∞	∞	∞	∞	∞	∞	∞	∞	0

Appendix A.2

Table A.2. The matrix of minimal distances between European Union countries ([2])

Country	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
01	0	2	3	2	3	1	2	5	4	2	1	2	1	4	1	4	3	2	2	2	2	4	2	1	1	3	3	3
02	2	0	4	4	4	2	2	5	4	1	1	3	3	2	2	4	3	1	3	1	2	3	4	3	3	2	3	1
03	3	4	0	3	2	4	5	7	7	3	4	1	2	5	2	6	5	4	3	5	4	5	1	3	3	4	6	4
04	2	4	3	0	4	3	4	6	6	3	3	3	1	5	2	5	4	4	3	4	3	5	2	2	1	4	5	4
05	3	4	2	4	0	4	5	8	7	3	4	1	4	5	2	7	6	4	3	5	5	5	3	4	3	4	6	4
06	1	2	4	3	4	0	2	4	4	2	1	3	2	4	2	3	2	2	3	2	1	4	3	1	2	3	3	3
07	2	2	5	4	5	2	0	3	2	2	1	4	3	4	3	4	3	2	4	2	2	4	4	3	3	3	1	3
08	5	5	7	6	8	4	3	0	1	5	4	7	5	7	6	1	2	5	7	5	3	7	6	4	6	6	2	6
09	4	4	7	6	7	4	2	1	0	4	3	6	5	6	5	2	3	4	6	4	4	6	6	5	5	5	1	5
10	2	1	3	3	3	2	2	5	4	0	1	2	3	2	1	4	3	1	2	2	2	2	4	3	2	1	3	1
11	1	1	4	3	4	1	1	4	3	1	0	3	2	3	2	3	2	1	3	1	1	3	3	2	2	2	2	2
12	2	3	1	3	1	3	4	7	6	2	3	0	3	4	1	6	5	3	2	4	4	4	2	3	2	3	5	3
13	1	3	2	1	4	2	3	5	5	3	2	3	0	5	2	4	3	3	3	3	2	5	1	1	1	4	4	4
14	4	2	5	5	5	4	4	7	6	2	3	4	5	0	3	6	5	3	4	2	4	4	6	5	4	3	5	1

15	1	2	2	2	2	2	3	6	5	1	2	1	2	3	0	5	4	2	1	3	3	3	3	2	1	2	4	2
16	4	4	6	5	7	3	4	1	2	4	3	6	4	6	5	0	1	4	6	4	2	6	5	3	5	5	3	5
17	3	3	5	4	6	2	3	2	3	3	2	5	3	5	4	1	0	3	5	3	1	5	4	2	4	4	4	4
18	2	1	4	4	4	2	2	5	4	1	1	3	3	3	2	4	3	0	3	2	2	3	4	3	3	2	3	2
19	2	3	3	3	3	3	4	7	6	2	3	2	3	4	1	6	5	3	0	4	4	4	4	3	2	3	5	3
20	2	1	5	4	5	2	2	5	4	2	1	4	3	2	3	4	3	2	4	0	2	4	4	3	3	3	3	1
21	2	2	4	3	5	1	2	3	4	2	1	4	2	4	3	2	1	2	4	2	0	4	3	1	3	3	3	3
22	4	3	5	5	5	4	4	7	6	2	3	4	5	4	3	6	5	3	4	4	4	0	6	5	4	1	5	3
23	2	4	1	2	3	3	4	6	6	4	3	2	1	6	3	5	4	4	4	4	3	6	0	2	2	5	5	5
24	1	3	3	2	4	1	3	4	5	3	2	3	1	5	2	3	2	3	3	3	1	5	2	0	2	4	4	4
25	1	3	3	1	3	2	3	6	5	2	2	2	1	4	1	5	4	3	2	3	3	4	2	2	0	3	4	3
26	3	2	4	4	4	3	3	6	5	1	2	3	4	3	2	5	4	2	3	3	3	1	5	4	3	0	4	2
27	3	3	6	5	6	3	1	2	1	3	2	5	4	5	4	3	4	3	5	3	3	5	5	4	4	4	0	4
28	3	1	4	4	4	3	3	6	5	1	2	3	4	1	2	5	4	2	3	1	3	3	5	4	3	2	4	0

Appendix A.3

Table A.3. The normalized matrix of strength of links between European Union countries

Country	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
01	0	0.0352	0.0235	0.0352	0.0235	0.0704	0.0352	0.0141	0.0176	0.0352	0.0704	0.0352	0.0704	0.0176	0.0704	0.0176	0.0235	0.0352	0.0352	0.0352	0.0352	0.0176	0.0352	0.0704	0.0704	0.0235	0.0235	0.0235
02	0.0389	0	0.0194	0.0194	0.0194	0.0389	0.0389	0.0155	0.0194	0.0777	0.0777	0.0259	0.0259	0.0389	0.0389	0.0194	0.0259	0.0777	0.0259	0.0777	0.0389	0.0259	0.0194	0.0259	0.0259	0.0389	0.0259	0.0777
03	0.0376	0.0282	0	0.0376	0.0564	0.0282	0.0226	0.0161	0.0161	0.0376	0.0282	0.1128	0.0564	0.0226	0.0564	0.0188	0.0226	0.0282	0.0376	0.0226	0.0282	0.0226	0.1128	0.0376	0.0376	0.0282	0.0188	0.0282

17	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**
0.0348	0.0303	0.0737	0.0317	0.0819	0.0471	0.0649	0.035	0.0316	0.0268	0.0462	0.079	0.0435	0.0528
0.0348	0.0303	0.0369	0.0635	0.0273	0.0313	0.0649	0.07	0.0316	0.0268	0.0462	0.0395	0.0326	0.0264
0.0209	0.0202	0.0369	0.0254	0.0409	0.0941	0.0162	0.0233	0.0181	0.0192	0.0185	0.0197	0.0653	0.0352
0.0261	0.0242	0.0369	0.0254	0.0819	0.0313	0.0216	0.0233	0.0211	0.0224	0.0231	0.0263	0.0326	0
0.0174	0.0173	0.0369	0.0254	0.0205	0.0941	0.0162	0.0233	0.0181	0.0168	0.0185	0.0197	0	0.0264
0.0522	0.0403	0.0369	0.0317	0.0409	0.0313	0.0649	0.035	0.0316	0.0335	0.0462	0	0.0326	0.0352
0.0348	0.0303	0.0245	0.0317	0.0273	0.0235	0.0649	0.035	0.0633	0.0447	0	0.0395	0.0261	0.0264
0.0522	0.1211	0.0123	0.0182	0.0164	0.0135	0.0162	0.014	0.1265	0	0.0308	0.0197	0.0163	0.0176
0.0348	0.0605	0.0147	0.0212	0.0164	0.0157	0.0216	0.0175	0	0.1341	0.0462	0.0197	0.0187	0.0176
0.0348	0.0303	0.0737	0.0635	0.0273	0.0471	0.0649	0	0.0316	0.0268	0.0462	0.0395	0.0435	0.0352
0.0522	0.0403	0.0369	0.0423	0.0409	0.0313	0	0.07	0.0421	0.0335	0.0925	0.079	0.0326	0.0352
0.0209	0.0202	0.0737	0.0317	0.0273	0	0.0216	0.035	0.0211	0.0192	0.0231	0.0263	0.1305	0.0352
0.0348	0.0303	0.0369	0.0254	0	0.0313	0.0324	0.0233	0.0253	0.0268	0.0308	0.0395	0.0326	0.1057
0.0209	0.0202	0.0245	0	0.0164	0.0235	0.0216	0.035	0.0211	0.0192	0.0231	0.0197	0.0261	0.0211
0.0261	0.0242	0	0.0423	0.0409	0.0941	0.0324	0.07	0.0253	0.0224	0.0308	0.0395	0.0653	0.0528
0.1044	0	0.0147	0.0212	0.0205	0.0157	0.0216	0.0175	0.0633	0.1341	0.0231	0.0263	0.0187	0.0211
0	0.1211	0.0184	0.0254	0.0273	0.0188	0.0324	0.0233	0.0421	0.067	0.0308	0.0395	0.0218	0.0264
0.0348	0.0303	0.0369	0.0423	0.0273	0.0313	0.0649	0.07	0.0316	0.0268	0.0462	0.0395	0.0326	0.0264
0.0209	0.0202	0.0737	0.0317	0.0273	0.0471	0.0216	0.035	0.0211	0.0192	0.0231	0.0263	0.0435	0.0352
0.0348	0.0303	0.0245	0.0635	0.0273	0.0235	0.0649	0.035	0.0316	0.0268	0.0462	0.0395	0.0261	0.0264
0.1044	0.0605	0.0245	0.0317	0.0409	0.0235	0.0649	0.035	0.0316	0.0447	0.0462	0.079	0.0261	0.0352
0.0209	0.0202	0.0245	0.0317	0.0164	0.0235	0.0216	0.035	0.0211	0.0192	0.0231	0.0197	0.0261	0.0211
0.0261	0.0242	0.0245	0.0212	0.0819	0.0471	0.0216	0.0175	0.0211	0.0224	0.0231	0.0263	0.0435	0.0528
0.0522	0.0403	0.0369	0.0254	0.0819	0.0313	0.0324	0.0233	0.0253	0.0335	0.0308	0.079	0.0326	0.0528
0.0261	0.0242	0.0737	0.0317	0.0819	0.0471	0.0324	0.035	0.0253	0.0224	0.0308	0.0395	0.0435	0.1057
0.0261	0.0242	0.0369	0.0423	0.0205	0.0313	0.0324	0.07	0.0253	0.0224	0.0308	0.0263	0.0326	0.0264
0.0261	0.0403	0.0184	0.0254	0.0205	0.0188	0.0324	0.0233	0.1265	0.067	0.0925	0.0263	0.0218	0.0211
0.0261	0.0242	0.0369	0.127	0.0205	0.0313	0.0324	0.07	0.0253	0.0224	0.0308	0.0263	0.0326	0.0264

28	27	26	25	24	23	22	21	20	19	18
0.0298	0.0372	0.0333	0.0829	0.0844	0.0533	0.0335	0.0404	0.0447	0.0553	0.0427
0.0894	0.0372	0.0499	0.0276	0.0281	0.0266	0.0446	0.0404	0.0894	0.0368	0.0855
0.0224	0.0187	0.025	0.0276	0.0281	0.1066	0.0268	0.0202	0.0179	0.0368	0.0214
0.0224	0.0224	0.025	0.0829	0.0422	0.0533	0.0268	0.0269	0.0224	0.0368	0.0214
0.0224	0.0187	0.025	0.0276	0.0211	0.0355	0.0268	0.0162	0.0179	0.0368	0.0214
0.0298	0.0372	0.0333	0.0414	0.0844	0.0355	0.0335	0.0809	0.0447	0.0368	0.0427
0.0298	0.1118	0.0333	0.0276	0.0281	0.0266	0.0335	0.0404	0.0447	0.0277	0.0427
0.0149	0.0559	0.0167	0.0138	0.0211	0.0178	0.0192	0.0269	0.0179	0.0158	0.0171
0.0179	0.1118	0.02	0.0166	0.0169	0.0178	0.0224	0.0202	0.0224	0.0185	0.0214
0.0894	0.0372	0.0999	0.0414	0.0281	0.0266	0.067	0.0404	0.0447	0.0553	0.0855
0.0447	0.0559	0.0499	0.0414	0.0422	0.0355	0.0446	0.0809	0.0894	0.0368	0.0855
0.0298	0.0224	0.0333	0.0414	0.0281	0.0533	0.0335	0.0202	0.0224	0.0553	0.0285
0.0224	0.0279	0.025	0.0829	0.0844	0.1066	0.0268	0.0404	0.0298	0.0368	0.0285
0.0894	0.0224	0.0333	0.0207	0.0169	0.0178	0.0335	0.0202	0.0447	0.0277	0.0285
0.0447	0.0279	0.0499	0.0829	0.0422	0.0355	0.0446	0.0269	0.0298	0.1106	0.0427
0.0179	0.0372	0.02	0.0166	0.0281	0.0213	0.0224	0.0404	0.0224	0.0185	0.0214
0.0224	0.0279	0.025	0.0207	0.0422	0.0266	0.0268	0.0809	0.0298	0.0221	0.0285
0.0447	0.0372	0.0499	0.0276	0.0281	0.0266	0.0446	0.0404	0.0447	0.0368	0
0.0298	0.0224	0.0333	0.0414	0.0281	0.0266	0.0335	0.0202	0.0224	0	0.0285
0.0894	0.0372	0.0333	0.0276	0.0281	0.0266	0.0335	0.0404	0	0.0277	0.0427
0.0298	0.0372	0.0333	0.0276	0.0844	0.0355	0.0335	0	0.0447	0.0277	0.0427
0.0298	0.0224	0.0999	0.0207	0.0169	0.0178	0	0.0202	0.0224	0.0277	0.0285
0.0179	0.0224	0.02	0.0414	0.0422	0	0.0224	0.0269	0.0224	0.0277	0.0214
0.0224	0.0279	0.025	0.0414	0	0.0533	0.0268	0.0809	0.0298	0.0368	0.0285
0.0298	0.0279	0.0333	0	0.0422	0.0533	0.0335	0.0269	0.0298	0.0553	0.0285
0.0447	0.0279	0	0.0276	0.0211	0.0213	0.1341	0.0269	0.0298	0.0368	0.0427
0.0224	0	0.025	0.0207	0.0211	0.0213	0.0268	0.0269	0.0298	0.0221	0.0285
0	0.0279	0.0499	0.0276	0.0211	0.0213	0.0446	0.0269	0.0894	0.0368	0.0427

Appendix A.4

Table A.4. The exports of European Union countries (million of Euro) during 2004-2009

Country/ Year	2004	2005	2006	2007	2008	2009
Austria	94703	100468	108913	119387	123259	98214
Belgium	246563	268735	292087	314449	320805	265986
Bulgaria	7708	9156	11748	13512	15204	11699
Croatia	6218	6960	8252	9004	9585	7516
Cyprus	758	1175	1062	1017	1110	901
Czech Republic	55286	62722	75604	89382	99809	80983
Denmark	61917	68403	73716	75280	79496	67382
Estonia	4767	6201	7719	8034	8470	6487
Finland	49441	52641	61489	65688	65580	45063
France	363208	372395	394925	408327	418983	348035
Germany	730444	779989	882532	964038	983255	803012
Greece	12970	14826	17273	19392	21319	17674
Hungary	44260	50405	59936	69610	73772	59513
Ireland	84227	88137	86593	88686	85477	83114
Italy	283494	299574	332013	364744	369016	291733
Latvia	3223	4148	4902	6062	6897	5522
Lithuania	7473	9489	11263	12509	16077	11797
Luxembourg	13060	15366	18337	16734	17470	15299
Malta	2023	1928	2226	2508	2367	2049
Netherlands	287110	326555	369249	401901	433722	356962
Poland	60216	71889	88229	102259	115895	97865
Portugal	28768	31137	35640	38294	38847	31697
Romania	18753	22172	25850	29543	33679	29085
Slovak Republic	22212	25583	33340	42696	48370	40208
Slovenia	12671	15270	18501	21980	23204	18695
Spain	146728	154815	170211	184821	191388	162990
Sweden	98950	105266	117707	123179	124645	93763
United Kingdom	279266	314136	359117	322387	321028	254704

Source: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tet00002

Table A.5. The exports of European Union countries (million of Euro) during 2010-2015

Country/ Year	2010	2011	2012	2013	2014	2015
Austria	115079	127462	129679	131885	134173	137755
Belgium	307530	341718	347089	352956	355528	359565
Bulgaria	15561	20265	20770	22272	22044	23161
Croatia	8905	9582	9629	9531	10431	11671
Cyprus	1058	1306	1354	1520	1364	1648
Czech Republic	100311	117054	122230	122185	131799	142822
Denmark	72747	80362	82090	82905	83468	85864
Estonia	8743	12003	12521	12289	12083	11627
Finland	52439	56855	56878	56048	55973	53900
France	395087	428501	442643	437439	436937	455990
Germany	949629	1058897	1090530	1088071	1125034	1198306
Greece	21140	24295	27585	27559	27221	25793
Hungary	72024	80684	80612	80945	83266	88934
Ireland	87875	90330	90888	87822	91792	110479
Italy	337407	375904	390182	390233	398870	413881
Latvia	7191	9433	10983	10893	10957	10865
Lithuania	15651	20151	23047	24545	24361	22984
Luxembourg	14180	14990	14659	13888	14485	15556
Malta	2705	3151	3308	2738	2206	2325
Netherlands	433173	479239	510098	505651	506339	511333
Poland	120483	135558	144282	154344	165715	178671
Portugal	37268	42828	45213	47303	48105	49858
Romania	37398	45284	45019	49571	52493	54609
Slovak Republic	48777	57349	62742	64566	65081	67998
Slovenia	22027	24915	25033	25615	27075	28820
Spain	191912	220223	229802	239314	244287	255441
Sweden	119597	134313	134141	126157	123921	126338
United Kingdom	313766	363915	367989	407060	380282	414761

Source: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tet00002

Appendix A.5

Table A.6. The imports of European Union countries (million of Euro) during 2004-2009

Country/ Year	2004	2005	2006	2007	2008	2009
Austria	96256	102283	109280	118962	125301	102569
Belgium	229574	256153	280053	300298	317043	254367
Bulgaria	11577	12473	15424	21862	25094	16876
Croatia	13241	14900	17105	18833	20817	15218
Cyprus	4420	5073	5518	6286	7237	5617
Czech Republic	56216	61483	74220	86224	96572	75314
Denmark	54787	60749	68100	71526	74356	59602
Estonia	6702	8229	10711	11439	10896	7270
Finland	41353	47234	55253	59616	62402	43655
France	378506	405164	431602	460315	487350	404098
Germany	575090	624465	722112	769779	805730	664143
Greece	44998	46382	52847	60130	64857	52087
Hungary	48580	53446	62331	69730	74069	55750
Ireland	49692	55112	58233	61162	57088	44955
Italy	285064	309032	352465	373340	382050	297609
Latvia	5701	6990	9191	11180	10975	7034
Lithuania	9957	12494	15429	17813	21144	13123
Luxembourg	16115	18170	21611	20452	21864	18160
Malta	2926	2988	3430	3503	3604	3210
Netherlands	256944	292415	331979	359443	394980	317718
Poland	72087	81697	101138	120912	141966	107155
Portugal	44173	51372	56295	59927	64194	51379
Romania	26235	32538	40746	51305	57148	38948
Slovak Republic	23988	27837	35828	44229	50253	39898
Slovenia	14159	16273	19227	23038	25180	19053
Spain	207656	232109	261784	284058	286105	210222
Sweden	80723	89781	101583	111803	114565	85945
United Kingdom	378293	417359	487951	465715	447228	372581

Source: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tet00002

Table A.7. The imports of European Union countries (million of Euro) during 2010-2015

Country/ Year	2010	2011	2012	2013	2014	2015
Austria	119943	137513	138942	138000	137001	140132
Belgium	295072	335447	341787	340093	342215	338750
Bulgaria	19245	23407	25460	25829	26118	26408
Croatia	15137	16281	16214	16581	17154	18558
Cyprus	6464	6234	5678	4754	5089	5016
Czech Republic	95536	109285	110066	108621	116203	126805
Denmark	62648	68724	71548	72728	74783	76957
Estonia	9268	12543	14077	13899	13775	13074
Finland	51899	60535	59517	58407	57769	54251
France	460941	517262	524918	513114	509299	515938
Germany	795666	901487	898857	889416	908575	946454
Greece	50741	48474	49291	46808	48004	43639
Hungary	66514	73592	74078	75379	78978	83487
Ireland	45467	47849	48855	54314	60721	66530
Italy	367390	401428	380292	361002	356939	368715
Latvia	8819	11703	13409	13451	13285	12900
Lithuania	17653	22826	24879	26208	25889	25397
Luxembourg	18713	20733	21437	20266	20099	20878
Malta	3818	4520	5135	4625	5132	5220
Netherlands	386834	426987	456824	444015	443689	456370
Poland	134306	151291	154934	156319	168366	174990
Portugal	58647	59551	56374	57013	58976	60162
Romania	46850	54943	54644	55328	58555	62976
Slovak Republic	49050	57358	60241	61543	61689	66289
Slovenia	22720	25525	24934	25129	25551	26789
Spain	246674	270550	262561	256455	270173	281298
Sweden	112352	127174	127985	120931	122132	124467
United Kingdom	445291	487905	541112	496977	519733	564190

Source: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tet00002

Appendix A.6

Table A.8. The imports of European Union countries (million of Euro) as functions of the exports of the others during 2004-2006

Country	2004 real	2004 computed	2005 real	2005 computed	2006 real	2006 computed
Austria	96256.00	134274.34	102283.00	145144.30	109280.00	163308.32
Belgium	229574.00	168280.37	256153.00	181965.09	280053.00	203640.76
Bulgaria	11577.00	97539.61	12473.00	105496.59	15424.00	117953.41
Croatia	13241.00	104536.66	14900.00	113249.71	17105.00	127103.55
Cyprus	4420.00	109430.71	5073.00	118065.42	5518.00	131799.06
Czech Republic	56216.00	142231.31	61483.00	153721.18	74220.00	172523.57
Denmark	54787.00	159185.12	60749.00	171662.41	68100.00	192578.86
Estonia	6702.00	94182.42	8229.00	102068.89	10711.00	114758.79
Finland	41353.00	107039.52	47234.00	115847.36	55253.00	129609.59
France	378506.00	149152.16	405164.00	161945.60	431602.00	181850.19
Germany	575090.00	110371.47	624465.00	120132.94	722112.00	133499.08
Greece	44998.00	114109.28	46382.00	122738.43	52847.00	136750.83
Hungary	48580.00	99897.71	53446.00	108217.10	62331.00	121529.75
Ireland	49692.00	158847.80	55112.00	172900.92	58233.00	193624.52
Italy	285064.00	109119.50	309032.00	117461.56	352465.00	130580.83
Latvia	5701.00	99156.86	6990.00	107724.98	9191.00	121202.89
Lithuania	9957.00	114355.48	12494.00	124279.42	15429.00	140010.25
Luxembourg	16115.00	179623.09	18170.00	193138.27	21611.00	214993.46
Malta	2926.00	133613.97	2988.00	143637.64	3430.00	159947.50
Netherlands	256944.00	166365.41	292415.00	179651.26	331979.00	200940.53
Poland	72087.00	137614.28	81697.00	148635.53	101138.00	166851.64
Portugal	44173.00	142468.25	51372.00	153135.77	56295.00	170200.75
Romania	26235.00	93921.66	32538.00	101949.70	40746.00	114738.17
Slovak Republic	23988.00	108144.62	27837.00	117494.07	35828.00	132253.33
Slovenia	14159.00	121353.61	16273.00	130722.12	19227.00	146080.18
Spain	207656.00	145190.29	232109.00	155900.29	261784.00	173067.89
Sweden	80723.00	121133.34	89781.00	131094.94	101583.00	146826.96
United Kingdom	378293.00	155518.68	417359.00	167345.76	487951.00	184624.67

Table A.9. The imports of European Union countries (million of Euro) as functions of the exports of the others during 2007-2009

Country	2007 real	2007 computed	2008 real	2008 computed	2009 real	2009 computed
Austria	118962.00	176907.67	125301.00	182930.94	102569.00	149219.17
Belgium	300298.00	215163.02	317043.00	222080.13	254367.00	181641.42
Bulgaria	21862.00	126567.68	25094.00	131005.61	16876.00	107036.55
Croatia	18833.00	137148.87	20817.00	142058.14	15218.00	115848.48
Cyprus	6286.00	141032.66	7237.00	145597.14	5617.00	118779.95
Czech Republic	86224.00	186189.03	96572.00	192543.30	75314.00	157406.40
Denmark	71526.00	207068.28	74356.00	213454.28	59602.00	173774.68
Estonia	11439.00	123046.13	10896.00	127368.57	7270.00	102815.36
Finland	59616.00	138432.60	62402.00	143034.45	43655.00	116305.01
France	460315.00	193481.21	487350.00	198730.65	404098.00	162209.70
Germany	769779.00	142111.11	805730.00	148378.11	664143.00	121704.74
Greece	60130.00	146487.20	64857.00	150842.99	52087.00	122742.87
Hungary	69730.00	131484.30	74069.00	136498.92	55750.00	111404.33
Ireland	61162.00	201134.69	57088.00	207046.45	44955.00	168527.84
Italy	373340.00	138628.06	382050.00	143280.52	297609.00	117638.95
Latvia	11180.00	130242.39	10975.00	135292.63	7034.00	110066.30
Lithuania	17813.00	151113.59	21144.00	157097.81	13123.00	128578.65
Luxembourg	20452.00	229857.47	21864.00	236687.49	18160.00	193862.77
Malta	3503.00	171267.85	3604.00	176259.09	3210.00	143440.19
Netherlands	359443.00	211995.73	394980.00	216980.09	317718.00	177363.49
Poland	120912.00	179959.47	141966.00	186118.49	107155.00	152032.23
Portugal	59927.00	181101.41	64194.00	186714.92	51379.00	153424.26
Romania	51305.00	124088.28	57148.00	128751.78	38948.00	104921.34
Slovak Republic	44229.00	143385.23	50253.00	149224.56	39898.00	121732.08
Slovenia	23038.00	157337.52	25180.00	162381.38	19053.00	132118.07
Spain	284058.00	183146.81	286105.00	188383.85	210222.00	154049.35

Sweden	111803.00	157248.38	114565.00	162512.64	85945.00	132519.16
United Kingdom	465715.00	198856.54	447228.00	205855.63	372581.00	170066.39

Table A.10. The imports of European Union countries (million of Euro) as functions of the exports of the others during 2010-2012

Country	2010 real	2010 computed	2011 real	2011 computed	2012 real	2012 computed
Austria	119943.00	176301.76	137513.00	197272.02	138942.00	203979.11
Belgium	295072.00	214825.56	335447.00	239858.73	341787.00	248155.45
Bulgaria	19245.00	126358.33	23407.00	141589.04	25460.00	146278.39
Croatia	15137.00	136908.53	16281.00	153319.18	16214.00	158237.62
Cyprus	6464.00	139953.11	6234.00	156656.90	5678.00	162000.26
Czech Republic	95536.00	185918.34	109285.00	207610.16	110066.00	214684.39
Denmark	62648.00	206074.27	68724.00	230148.30	71548.00	237437.56
Estonia	9268.00	121928.77	12543.00	136457.66	14077.00	140887.27
Finland	51899.00	138251.06	60535.00	154936.31	59517.00	159716.34
France	460941.00	191839.00	517262.00	215338.68	524918.00	222024.95
Germany	795666.00	143395.27	901487.00	159964.35	898857.00	165724.24
Greece	50741.00	144347.37	48474.00	161491.27	49291.00	166685.95
Hungary	66514.00	131824.11	73592.00	147788.28	74078.00	152822.99
Ireland	45467.00	200087.12	47849.00	224617.18	48855.00	231677.47
Italy	367390.00	138454.59	401428.00	154553.68	380292.00	159445.94
Latvia	8819.00	130629.93	11703.00	146544.07	13409.00	151627.72
Lithuania	17653.00	152392.09	22826.00	170611.14	24879.00	176657.57
Luxembourg	18713.00	228154.77	20733.00	254390.36	21437.00	262500.10
Malta	3818.00	168470.98	4520.00	188193.60	5135.00	194442.21
Netherlands	386834.00	209184.44	426987.00	234304.69	456824.00	240551.39
Poland	134306.00	179769.32	151291.00	201255.02	154934.00	208042.68
Portugal	58647.00	180518.30	59551.00	202036.13	56374.00	208762.94
Romania	46850.00	124211.70	54943.00	139186.32	54644.00	143787.68
Slovak Republic	49050.00	144352.39	57358.00	161699.97	60241.00	167065.44
Slovenia	22720.00	155682.97	25525.00	173990.57	24934.00	179642.25
Spain	246674.00	180736.99	270550.00	201207.35	262561.00	207614.22

Sweden	112352.00	155738.58	127174.00	173854.84	127985.00	179526.99
United Kingdom	445291.00	198967.23	487905.00	220410.04	541112.00	228362.66

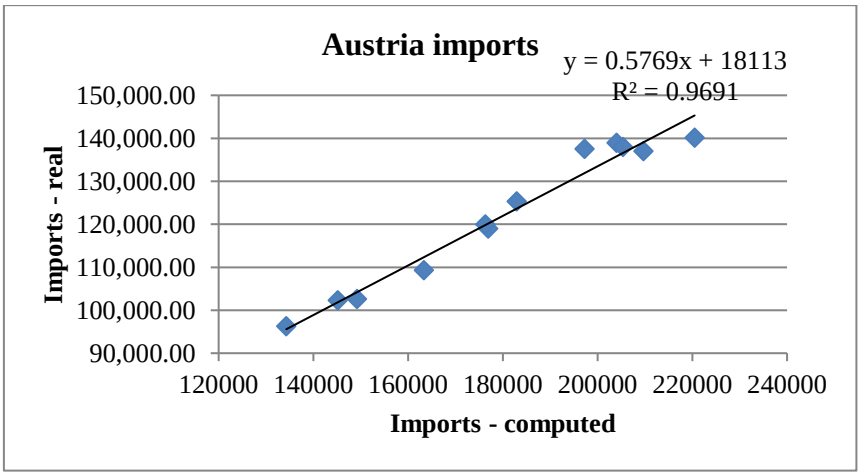
Table A.11. The imports of European Union countries (million of Euro) as functions of the exports of the others during 2013-2015

Country	2013 real	2013 computed	2014 real	2014 computed	2015 real	2015 computed
Austria	138000.00	205349.42	137001.00	209683.58	140132.00	220485.61
Belgium	340093.00	250989.30	342215.00	253562.71	338750.00	267145.90
Bulgaria	25829.00	148260.27	26118.00	150511.44	26408.00	157623.03
Croatia	16581.00	160060.43	17154.00	162783.82	18558.00	170843.60
Cyprus	4754.00	163881.80	5089.00	166062.30	5016.00	173848.59
Czech Republic	108621.00	216712.55	116203.00	220918.33	126805.00	232016.96
Denmark	72728.00	238504.13	74783.00	242830.66	76957.00	255029.18
Estonia	13899.00	141942.38	13775.00	143994.51	13074.00	150277.17
Finland	58407.00	160315.50	57769.00	162367.68	54251.00	169876.07
France	513114.00	225875.98	509299.00	228879.24	515938.00	240843.43
Germany	889416.00	167794.77	908575.00	169350.65	946454.00	175974.53
Greece	46808.00	168576.34	48004.00	170970.21	43639.00	179240.17
Hungary	75379.00	154661.07	78978.00	157694.35	83487.00	165352.31
Ireland	54314.00	237148.90	60721.00	236969.08	66530.00	248703.99
Italy	361002.00	161359.26	356939.00	163139.61	368715.00	171269.81
Latvia	13451.00	153254.29	13285.00	155837.21	12900.00	163126.93
Lithuania	26208.00	178774.20	25889.00	182519.48	25397.00	191946.03
Luxembourg	20266.00	264745.82	20099.00	268802.53	20878.00	282040.33
Malta	4625.00	196446.34	5132.00	199219.80	5220.00	208695.82
Netherlands	444015.00	244839.33	443689.00	247761.74	456370.00	262001.60
Poland	156319.00	209263.92	168366.00	213198.20	174990.00	223979.93
Portugal	57013.00	211739.86	58976.00	214414.45	60162.00	225020.11
Romania	55328.00	145250.28	58555.00	147743.20	62976.00	155037.36
Slovak Republic	61543.00	169041.84	61689.00	172986.95	66289.00	181873.40
Slovenia	25129.00	181301.13	25551.00	184356.69	26789.00	193306.57
Spain	256455.00	209570.21	270173.00	211744.11	281298.00	222302.06

Sweden	120931.00	181227.64	122132.00	184243.03	124467.00	192927.63
United Kingdom	496977.00	228483.51	519733.00	232194.00	414761.00	242093.07

Appendix A.7

Table A.12. The regression analysis of the real imports of Austria in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.984434543
R Square	0.969111369
Adjusted R Square	0.966022506
Standard Error	3019.820038
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2861127147	2861127147	313.743714	7.01067E-09
Residual	10	91193130.6	9119313.06		
Total	11	2952320278			

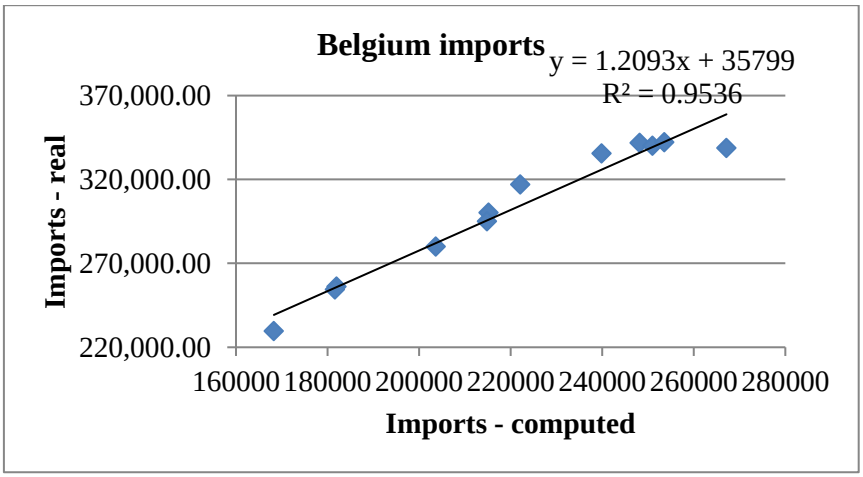
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	18112.54238	5939.687936	3.04940976	0.01226406	4878.092921	31346.9918
X Variable 1	0.576865784	0.032567713	17.7128121	7.0107E-09	0.504300397	0.64943117

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.078798

Observation	Predicted Y	Residuals
1	95570.81475	685.1852481
2	101841.3227	441.6772541
3	112319.5244	-3039.524378
4	120164.5241	-1202.524073
5	123639.1424	1661.857558
6	104191.9758	-1622.975822
7	119814.9953	128.0046736
8	131912.0208	5600.979205
9	135781.1115	3160.888476
10	136571.5965	1428.403524
11	139071.8251	-2070.825081
12	145303.1466	-5171.146583

Appendix A.8

Table A.13. The regression analysis of the real imports of Belgium in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.976537421
R Square	0.953625335
Adjusted R Square	0.948987869
Standard Error	9006.561858
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	16680730715	16680730715	205.6349828	5.38357E-08
Residual	10	811181565	81118156.5		
Total	11	17491912280			

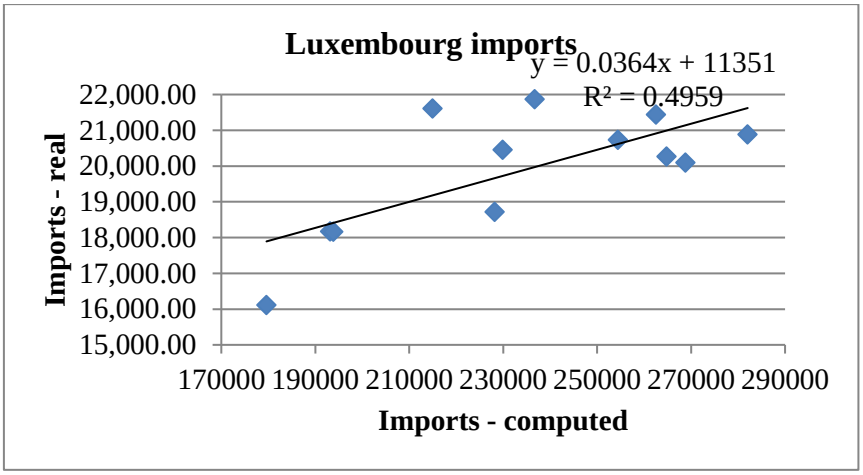
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 91.0%*	*Upper 91.0%*
Intercept	35798.97447	18784.18168	1.905804314	0.085796996	545.303395	71052.64555
X Variable 1	1.209252484	0.084327357	14.33997848	5.38357E-08	1.05098906	1.367515907

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.1645678

Observation	Predicted Y	Residuals
1	239292.4299	-9718.429862
2	255840.7115	312.2884885
3	282052.0693	-1999.069296
4	295985.3908	4312.609181
5	304349.9233	12693.07673
6	255449.3128	-1082.31276
7	295577.3165	-505.3164761
8	325848.7395	9598.260525
9	335881.5687	5905.431258
10	339308.4089	784.5911073
11	342420.3113	-205.3113269
12	358845.8176	-20095.81757

Appendix A.9

Table A.14. The regression analysis of the real imports of Luxembourg in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.704218547
R Square	0.495923762
Adjusted R Square	0.445516138
Standard Error	1290.21588
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	16377343.49	16377343.49	9.838268979	0.010571103
Residual	10	16646570.17	1664657.017		
Total	11	33023913.67			

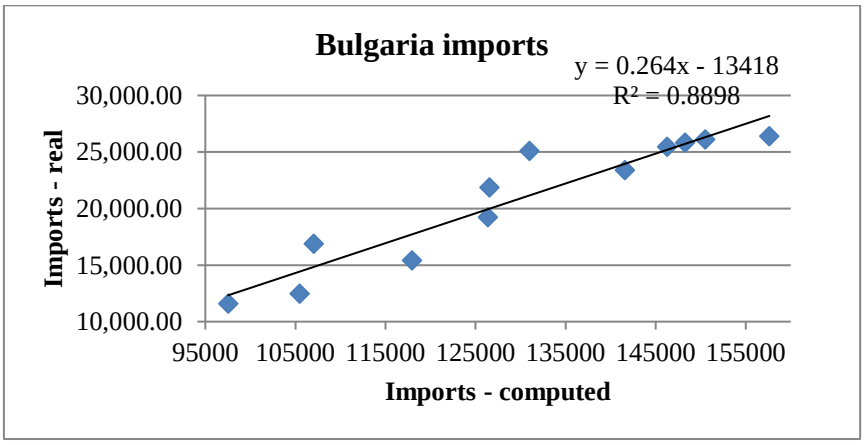
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	11351.04349	2742.928742	4.138293247	0.002017319	5239.417391	17462.66959
X Variable 1	0.036416123	0.011610057	3.136601502	0.010571103	0.010547303	0.062284943

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.310979289

Observation	Predicted Y	Residuals
1	17892.22008	-1777.220077
2	18384.39054	-214.3905378
3	19180.27183	2430.728169
4	19721.56145	730.4385486
5	19970.2843	1893.715698
6	18410.77402	-250.7740191
7	19659.55572	-946.5557183
8	20614.9542	118.0458021
9	20910.27949	526.7205106
10	20992.05991	-726.0599057
11	21139.78956	-1040.789557
12	21621.85891	-743.8589138

Appendix A.10

Table A.15. The regression analysis of the real imports of Bulgaria in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.943277059
R Square	0.88977161
Adjusted R Square	0.878748771
Standard Error	1919.381011
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	297377064.3	297377064.3	80.72073019	4.20279E-06
Residual	10	36840234.67	3684023.467		
Total	11	334217298.9			

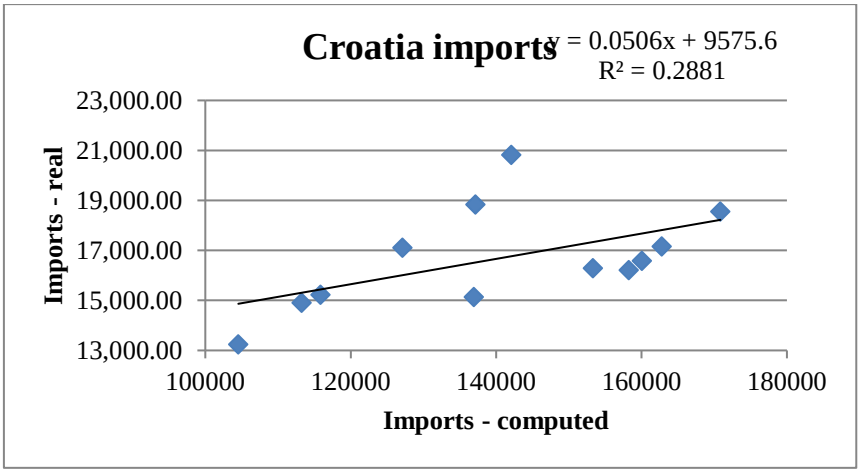
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-13417.99393	3850.251515	-3.484965561	0.005872231	-21996.88892	-4839.098939
X Variable 1	0.263965853	0.029380231	8.984471614	4.20279E-06	0.198502619	0.329429088

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.018084921

Observation	Predicted Y	Residuals
1	12329.13246	-752.1324629
2	14429.50348	-1956.503479
3	17717.6786	-2293.678601
4	19991.55173	1870.448268
5	21163.01371	3930.986288
6	14836.00033	2039.999666
7	19936.29048	-691.2904811
8	23956.67784	-549.6778438
9	25194.50612	265.4938816
10	25717.65476	111.3452361
11	26311.88677	-193.886774
12	28189.1037	-1781.103697

Appendix A.11

Table A.16. The regression analysis of the real imports of Croatia in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.536778481
R Square	0.288131137
Adjusted R Square	0.216944251
Standard Error	1801.31873
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	13133223.23	13133223.23	4.047531119	0.071952578
Residual	10	32447491.68	3244749.168		
Total	11	45580714.92			

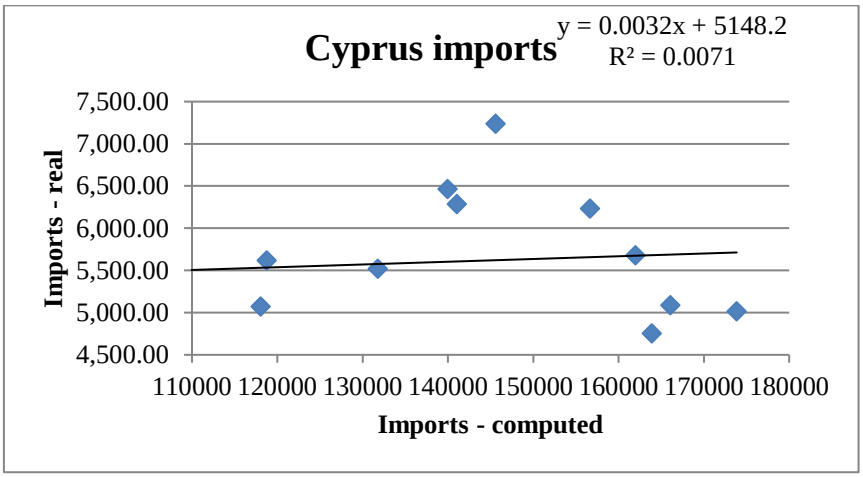
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 92.0%*	*Upper 92.0%*
Intercept	9575.555906	3564.424956	2.686423764	0.022839479	2631.701543	16519.41027
X Variable 1	0.050610784	0.02515637	2.011847688	0.071952578	0.001603674	0.099617895

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.90205392

Observation	Predicted Y	Residuals
1	14866.23827	-1625.23827
2	15307.21257	-407.2125655
3	16008.36628	1096.633725
4	16516.7678	2316.2322
5	16765.22981	4051.770194
6	15438.73835	-220.7383537
7	16504.604	-1367.604004
8	17335.15987	-1054.159874
9	17584.08598	-1370.085981
10	17676.33982	-1095.339824
11	17814.17273	-660.1727287
12	18222.08452	335.9154832

Appendix A.12

Table A.17. The regression analysis of the real imports of Cyprus in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.084453965
R Square	0.007132472
Adjusted R Square	-0.092154281
Standard Error	851.1760671
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	52046.02816	52046.02816	0.071837099	0.794127937
Residual	10	7245006.972	724500.6972		
Total	11	7297053			

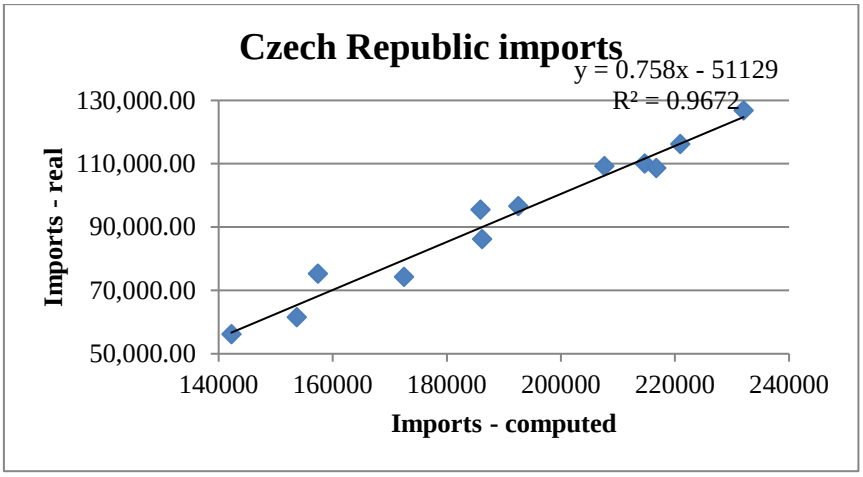
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 20.0%*	*Upper 20.0%*
Intercept	5148.213658	1760.676501	2.923997484	0.015196114	4690.112343	5606.314973
X Variable 1	0.00324672	0.012113523	0.268024437	0.794127937	9.49653E-05	0.006398475

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.87224119

Observation	Predicted Y	Residuals
1	5503.504554	-1083.504554
2	5531.539042	-458.5390418
3	5576.128328	-58.12832824
4	5606.107244	679.8927561
5	5620.926833	1616.073167
6	5533.858921	83.14107918
7	5602.602247	861.3977529
8	5656.834779	577.1652205
9	5674.183174	3.816825671
10	5680.292008	-926.2920083
11	5687.371482	-598.3714816
12	5712.651387	-696.6513867

Appendix A.13

Table A.18. The regression analysis of the real imports of Czech Republic in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.972156908
R Square	0.945089055
Adjusted R Square	0.93959796
Standard Error	5524.728906
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5253343006	5253343006	172.113055	1.2577E-07
Residual	10	305226294.8	30522629.48		
Total	11	5558569301			

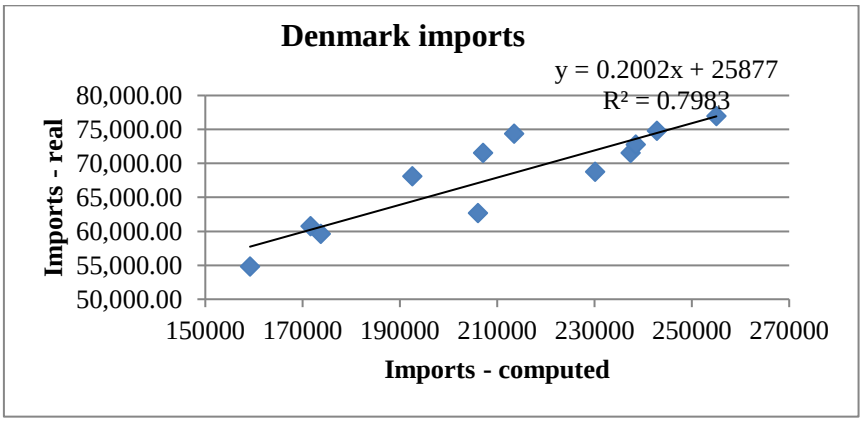
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-59893.965	11766.2755	-5.09030789	0.000470641	-86110.86058	-33677.06942
X Variable 1	0.837836299	0.063863434	13.11918652	1.2577E-07	0.695539701	0.980132897

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.969896117

Observation	Predicted Y	Residuals
1	53062.99921	3153.000794
2	64121.15647	-2638.156468
3	81383.64234	-7163.642337
4	91803.25942	-5579.259421
5	99855.17626	-3283.176257
6	68330.97387	6983.026127
7	92694.06373	2841.936269
8	111297.0039	-2012.003896
9	113654.5579	-3588.557945
10	110495.8062	-1874.806178
11	113572.207	2630.792985
12	116274.1537	10530.84632

Appendix A.14

Table A.19. The regression analysis of the real imports of Denmark in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.893458341
R Square	0.798267807
Adjusted R Square	0.778094588
Standard Error	3303.144877
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	431746325.9	431746325.9	39.57067017	9.01837E-05
Residual	10	109107660.8	10910766.08		
Total	11	540853986.7			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	25877.46319	6770.404189	3.822144508	0.003361751	10792.06257	40962.86381
X Variable 1	0.200169675	0.031820836	6.290522249	9.01837E-05	0.129268435	0.271070915

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.812480069

Observation	Predicted Y	Residuals
1	57741.49693	-2954.496934
2	60239.07202	509.9279817
3	64425.91102	3674.088982
4	67326.25351	4199.746489
5	68604.53706	5751.462945
6	60661.88442	-1059.884418
7	67127.28285	-4479.282852
8	71946.17361	-3222.173614
9	73405.26242	-1857.262419
10	73618.75739	-890.7573896
11	74484.79749	298.2025063
12	76926.57128	30.42872192

Table A.20. The regression analysis of the real imports of Denmark, after eliminating the autoregression, in function of exports of the other EU countries (million of Euro)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.857868942
R Square	0.735939122
Adjusted R Square	0.706599024
Standard Error	2637.901525
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	174541013.6	174541013.6	25.08304953	0.000730649
Residual	9	62626720.11	6958524.457		
Total	10	237167733.7			

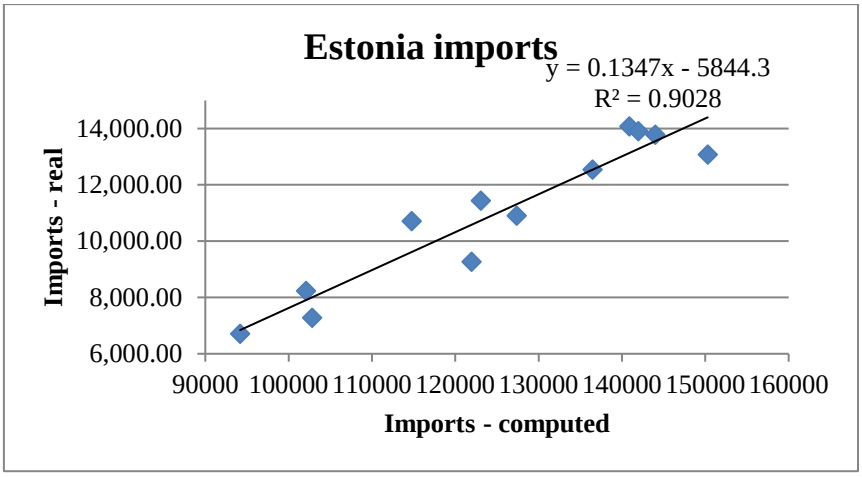
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 88.0%*	*Upper 88.0%*
Intercept	7957.141817	4526.129266	1.758045639	0.11260838	183.1573702	15731.12626
X Variable 1	0.233546747	0.046631958	5.008298067	0.000730649	0.153452676	0.313640818

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.91299833

Observation	Predicted Y	Residuals
1	26496.50567	2492.131632
2	29692.19303	3191.236004
3	30244.30329	1803.705594
4	29774.03207	3117.903427
5	19642.39965	-3145.032655
6	32558.02508	-4461.673054
7	33807.44365	-1400.876654
8	32250.47996	-542.2077355
9	31512.69198	-261.510023
10	32378.73768	243.3909785
11	34641.89997	-1037.067514

Appendix A.15

Table A.21. The regression analysis of the real imports of Estonia in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.950165109
R Square	0.902813735
Adjusted R Square	0.893095108
Standard Error	857.191011
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	68257201.96	68257201.96	92.8951981	2.22587E-06
Residual	10	7347764.293	734776.4293		
Total	11	75604966.25			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-5844.295155	1764.086636	-3.312929781	0.007840452	-9774.925127	-1913.665182
X Variable 1	0.134700794	0.013975699	9.638215504	2.22587E-06	0.103560997	0.165840591

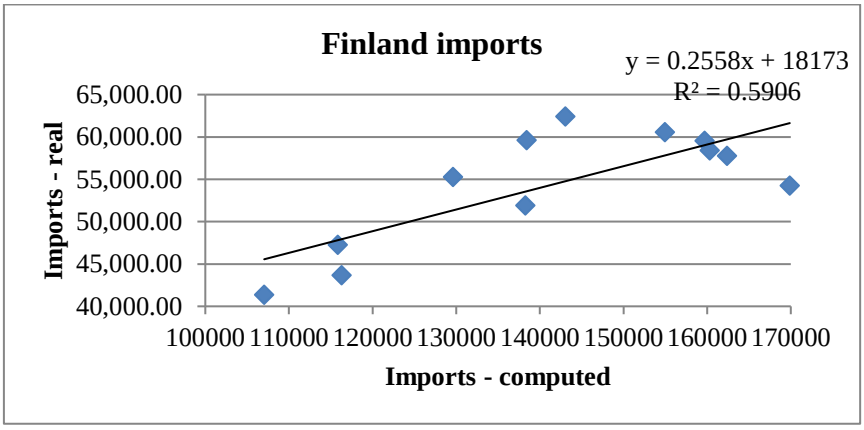
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.0801031

Observation	Predicted Y	Residuals
1	6842.151616	-140.1516158

2	7904.465388	324.5346121
3	9613.804996	1097.195004
4	10730.11628	708.8837247
5	11312.35238	-416.352376
6	8005.01549	-735.0154898
7	10579.607	-1311.606996
8	12536.66002	6.339982727
9	13133.332	943.6679979
10	13275.45616	623.543843
11	13551.8797	223.1203022
12	14398.15899	-1324.158989

Appendix A.16

Table A.22. The regression analysis of the real imports of Finland in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.768516905
R Square	0.590618234
Adjusted R Square	0.549680057

Standard Error	4642.330099
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	310921240.7	310921240.7	14.42707719	0.00349553
Residual	10	215512287.5	21551228.75		
Total	11	526433528.3			

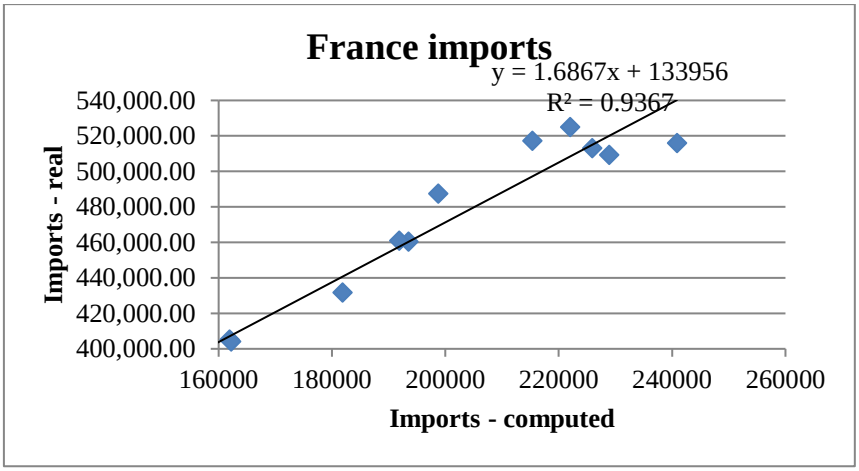
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 91.0%*	*Upper 91.0%*
Intercept	18173.07584	9611.610538	1.890742011	0.087954402	134.2513546	36211.90033
X Variable 1	0.255827112	0.067353069	3.79829925	0.00349553	0.129420597	0.382233627

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.140441508

Observation	Predicted Y	Residuals
1	45556.68712	-4203.687118
2	47809.97139	-575.9713891
3	51330.72295	3922.277055
4	53587.88811	6028.111887
5	54765.16611	7636.833891
6	47927.05067	-4272.050667
7	53541.44526	-1642.445259
8	57809.98458	2725.015419
9	59032.84585	484.1541488
10	59186.12722	-779.1272237
11	59711.13051	-1942.130507
12	61631.98024	-7380.980236

Appendix A.17

Table A.23. The regression analysis of the real imports of France in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.967817933
R Square	0.936671552
Adjusted R Square	0.930338707
Standard Error	13679.70087
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	27678444842	27678444842	147.9069165	2.57562E-07
Residual	10	1871342159	187134215.9		
Total	11	29549787001			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	133956.0736	27698.48771	4.836223371	0.00068536	72239.997	195672.1502
X Variable 1	1.686655166	0.13868582	12.16169875	2.57562E-07	1.377643901	1.99566643

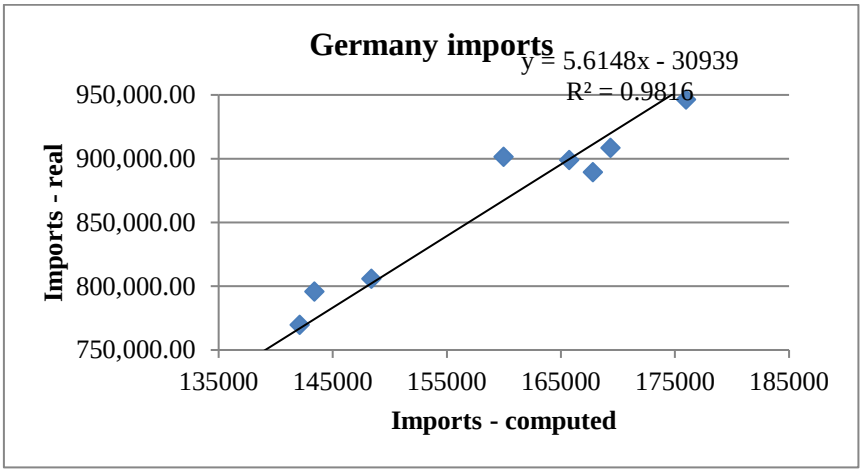
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.012440681

Observation	Predicted Y	Residuals
1	385524.3347	-7018.334738

2	407102.4564	-1938.456399
3	440674.6359	-9072.635942
4	460292.1559	22.84409356
5	469146.151	18203.849
6	407547.902	-3449.902029
7	457522.3139	3418.686073
8	497158.1706	20103.82941
9	508435.6024	16482.39758
10	514930.9621	-1816.962066
11	519996.4261	-10697.42606
12	540175.8889	-24237.88892

Appendix A.18

Table A.24. The regression analysis of the real imports of Germany in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.990771488
R Square	0.981628142
Adjusted R Square	0.979790956
Standard Error	17536.24845

Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.64311E+11	1.64311E+11	534.3107566	5.1906E-10
Residual	10	3075200096	307520009.6		
Total	11	1.67386E+11			

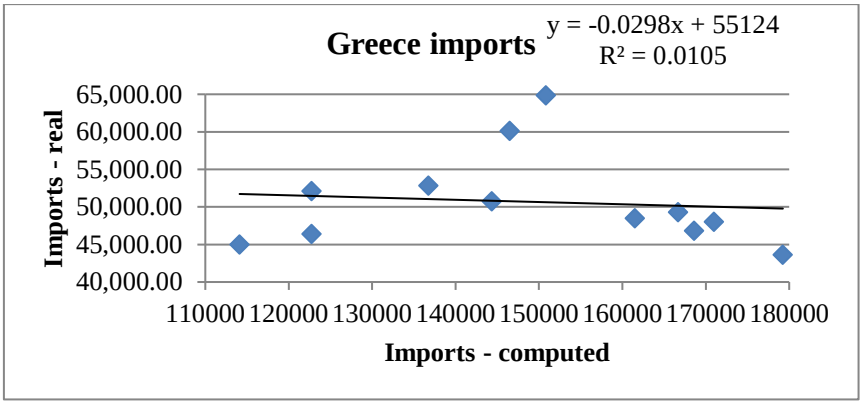
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 59.0%*	*Upper 59.0%*
Intercept	-30938.86458	35951.85188	-0.860563864	0.409636602	-61852.86799	-24.86116572
X Variable 1	5.614782359	0.242904728	23.11516292	5.1906E-10	5.4059153	5.823649419

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.859251646

Observation	Predicted Y	Residuals
1	588772.9181	-13682.91813
2	643581.4477	-19116.44769
3	718629.4148	3482.585233
4	766984.0889	2794.911112
5	802171.9299	3558.070068
6	652406.7626	11736.2374
7	774194.3678	21471.6322
8	867226.1459	34260.85411
9	899566.6747	-709.6746559
10	911192.25	-21776.24997
11	919928.1776	-11353.17755
12	957119.8221	-10665.82212

Appendix A.19

Table A.24. The regression analysis of the real imports of Greece in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.102395208
R Square	0.010484779
Adjusted R Square	-0.088466744
Standard Error	6494.473544
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4469147.475	4469147.475	0.105958739	0.751501439
Residual	10	421781866.2	42178186.62		
Total	11	426251013.7			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 24.0%*	*Upper 24.0%*
Intercept	55123.63841	13754.46566	4.007690287	0.002487297	50805.23017	59442.04665
X Variable 1	-0.029818583	0.09160488	-0.32551304	0.751501439	-0.058579225	-0.001057941

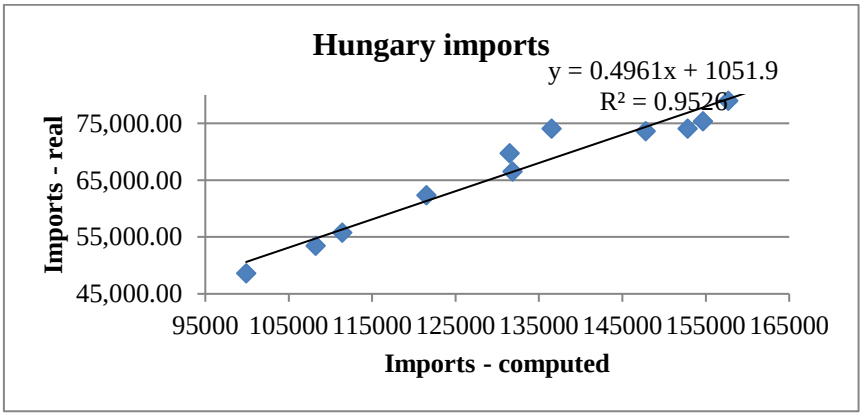
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.818344406

Observation	Predicted Y	Residuals
1	51721.06138	-6723.061382

2	51463.75236	-5081.752357
3	51045.92245	1801.077554
4	50755.59769	9374.40231
5	50625.7142	14231.2858
6	51463.61996	623.380037
7	50819.40439	-78.40438784
8	50308.19758	-1834.197584
9	50153.29959	-862.2995874
10	50096.93084	-3288.930836
11	50025.54903	-2021.549025
12	49778.95054	-6139.950537

Appendix A.20

Table A.25. The regression analysis of the real imports of Hungary in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.975993593
R Square	0.952563493
Adjusted R Square	0.947819842
Standard Error	2479.675346
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1234726815	1234726815	200.8081021	6.03157E-08
Residual	10	61487898.24	6148789.824		
Total	11	1296214713			

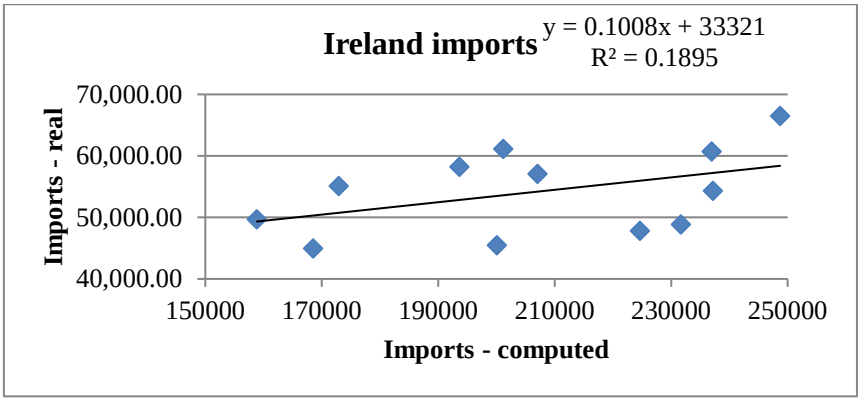
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 16.0%*	*Upper 16.0%*
Intercept	1051.909516	4777.947433	0.22015929	0.830176567	61.84283104	2041.976202
X Variable 1	0.496123629	0.035010579	14.17067755	6.03157E-08	0.48886888	0.503378378

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.973656826

Observation	Predicted Y	Residuals
1	50613.52391	-2033.52391
2	54740.96987	-1294.969866
3	61345.69009	985.3099069
4	66284.37756	3445.622438
5	68772.24903	5296.750966
6	56322.22998	-572.2299796
7	66452.96533	61.03466758
8	74373.16728	-781.1672835
9	76871.00588	-2793.005879
10	77782.9208	-2403.920798
11	79287.80268	-309.802679
12	83087.09758	399.9024166

Appendix A.21

Table A.26. The regression analysis of the real imports of Ireland in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.435345178
R Square	0.189525424
Adjusted R Square	0.108477967
Standard Error	6488.265024
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	98443091.49	98443091.49	2.338449964	0.157209809
Residual	10	420975830.2	42097583.02		
Total	11	519418921.7			

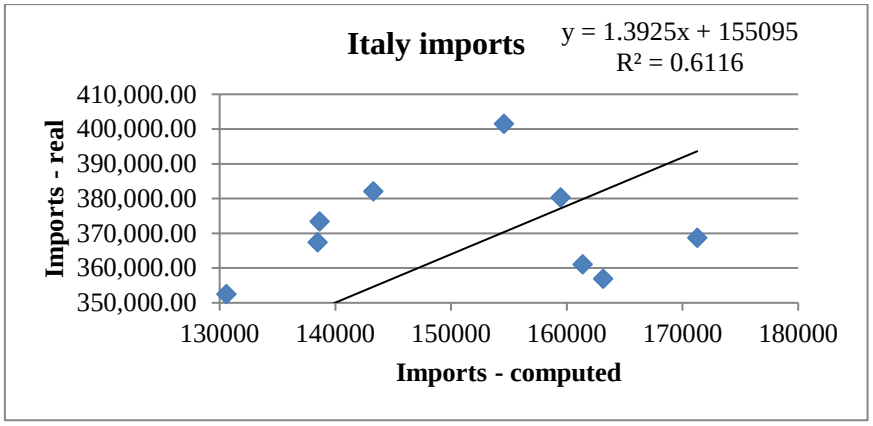
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 84.0%*	*Upper 84.0%*
Intercept	33320.92027	13758.69154	2.421808802	0.035950252	12436.63	54205.21053
X Variable 1	0.100805373	0.065920371	1.529199125	0.157209809	0.000744975	0.200865771

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.48855042

Observation	Predicted Y	Residuals
1	49333.632	358.3679991
2	50750.262	4361.737995
3	52839.31223	5393.687766
4	53596.37772	7565.622278
5	54192.31489	2895.685106
6	50309.43204	-5354.432044
7	53490.77704	-8023.777037
8	55963.53889	-8114.538886
9	56675.25405	-7820.254054
10	57226.8036	-2912.803596
11	57208.67677	3512.323226
12	58391.61875	8138.381246

Appendix A.22

Table A.27. The regression analysis of the real imports of Italy in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.782078665
R Square	0.611647039
Adjusted R Square	0.572811743
Standard Error	23728.52009
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	8867793310	8867793310	15.74977146	0.002649341
Residual	10	5630426658	563042665.8		
Total	11	14498219968			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	155094.5257	50322.08011	3.082037257	0.011600318	42969.94394	267219.1076
X Variable 1	1.392543081	0.35089042	3.968598174	0.002649341	0.610710503	2.174375658

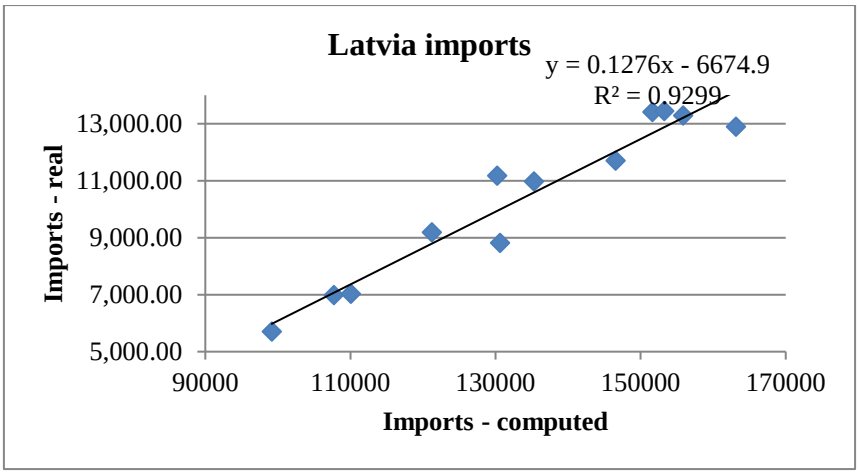
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.130386862

Observation	Predicted Y	Residuals
1	307048.1304	-21984.13042

2	318664.8084	-9632.808351
3	336933.957	15531.04299
4	348140.0715	25199.92853
5	354618.8224	27431.17755
6	318911.8316	-21302.83157
7	347898.507	19491.49298
8	370317.1834	31110.8166
9	377129.8662	3162.13379
10	379794.2467	-18792.24674
11	382273.4608	-25334.46081
12	393595.1146	-24880.11456

Appendix A.23

Table A.28. The regression analysis of the real imports of Latvia in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.964324436
R Square	0.929921617
Adjusted R Square	0.922913779
Standard Error	769.8415789
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	78643892.43	78643892.43	132.6973572	4.28652E-07
Residual	10	5926560.566	592656.0566		
Total	11	84570453			

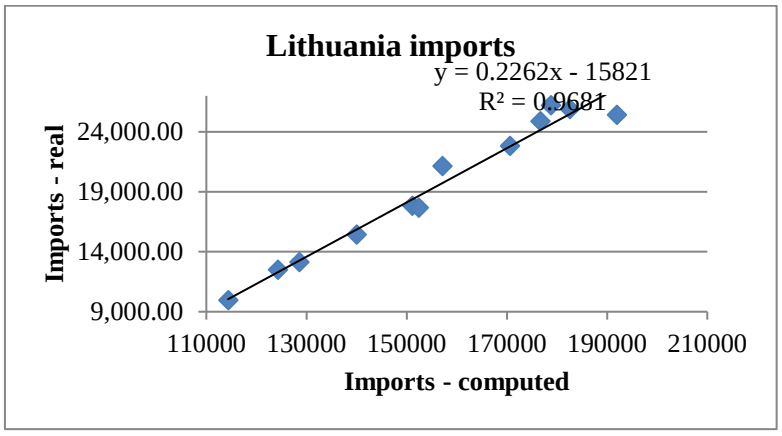
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-6674.882369	1497.675551	-4.456828025	0.001222129	-10011.91145	-3337.853285
X Variable 1	0.127585092	0.011075639	11.51943389	4.28652E-07	0.10290703	0.152263154

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.141337721

Observation	Predicted Y	Residuals
1	5976.054753	-275.0547531
2	7069.219133	-79.21913303
3	8788.799523	402.2004774
4	9942.104963	1237.895037
5	10586.4403	388.5597009
6	7367.936661	-333.936661
7	9991.54929	-1172.54929
8	12021.95631	-318.9563085
9	12670.55426	738.4457378
10	12878.08035	572.9196544
11	13207.62243	77.37756813
12	14137.68203	-1237.68203

Appendix A.24

Table A.29. The regression analysis of the real imports of Lithuania in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.983945782
R Square	0.968149302
Adjusted R Square	0.964964232
Standard Error	1080.90361
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	355138141.9	355138141.9	303.9648625	8.17599E-09
Residual	10	11683526.15	1168352.615		
Total	11	366821668			

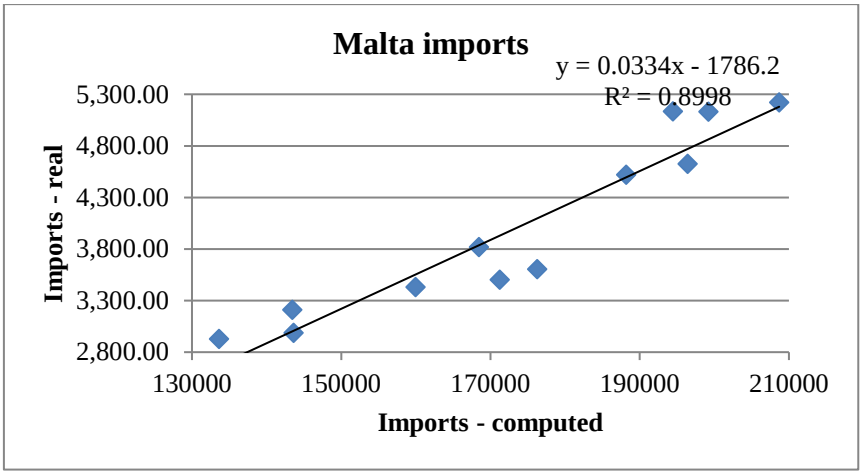
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-15820.96621	2044.18992	-7.739479613	1.57173E-05	-20375.70519	-11266.22723
X Variable 1	0.226224651	0.012975624	17.43458811	8.17599E-09	0.19731316	0.255136142

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.552895926

Observation	Predicted Y	Residuals
1	10049.06238	-92.06237751
2	12294.10224	199.8977563
3	15852.80378	-423.8037755
4	18364.653	-551.6529955
5	19718.43108	1425.568922
6	13266.69405	-143.6940514
7	18653.88121	-1000.881212
8	22775.47945	50.52055412
9	24143.33096	735.6690356
10	24622.16485	1585.835152
11	25469.43951	419.5604898
12	27601.9575	-2204.957497

Appendix A.25

Table A.30. The regression analysis of the real imports of Malta in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.948557034
R Square	0.899760446
Adjusted R Square	0.889736491
Standard Error	288.1224599
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	7451470.731	7451470.731	89.7610185	2.60181E-06
Residual	10	830145.5189	83014.55189		
Total	11	8281616.25			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1786.180846	617.3334283	-2.893381054	0.01601414	-3161.685442	-410.6762495
X Variable 1	0.033376849	0.003522909	9.474229179	2.6018E-06	0.025527318	0.04122638

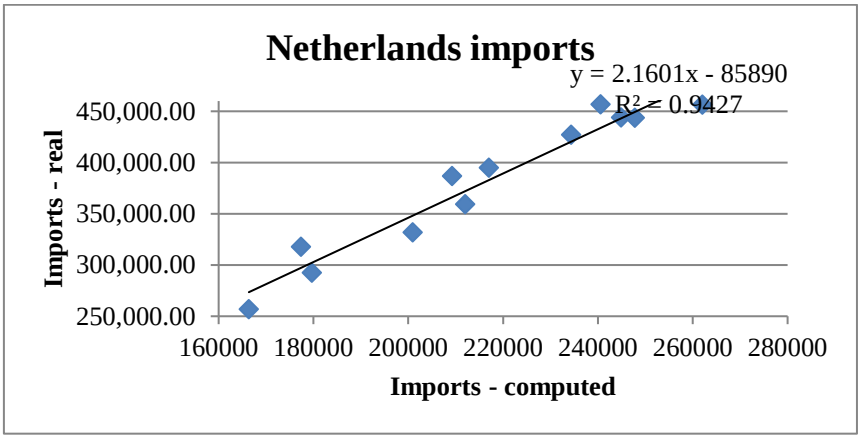
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.746023383

Observation	Predicted Y	Residuals
1	2673.432437	252.5675629

2	3007.990956	-19.99095574
3	3552.362688	-122.3626879
4	3930.200299	-427.200299
5	4096.792162	-492.7921621
6	3001.400697	208.5993031
7	3836.849592	-18.84959169
8	4495.128499	24.87150139
9	4703.68741	431.3125898
10	4770.578954	-145.5789543
11	4863.14831	268.8516905
12	5179.427997	40.57200309

Appendix A.26

Table A.31. The regression analysis of the real imports of Netherlands in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.970946929
R Square	0.942737939
Adjusted R Square	0.937011733
Standard Error	17219.81974
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	48818138004	48818138004	164.635698	1.55262E-07
Residual	10	2965221918	296522191.8		
Total	11	51783359922			

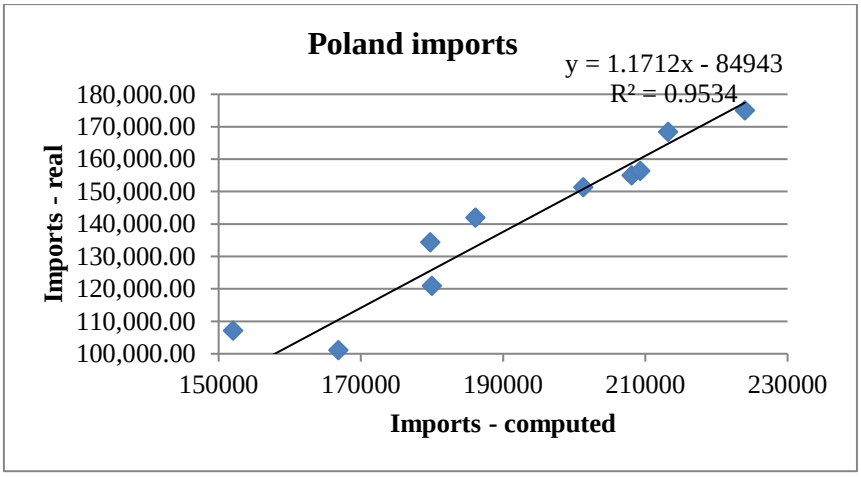
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-85890.2647	36701.05671	-2.340266804	0.041320763	-167665.3151	-4115.214327
X Variable 1	2.160112435	0.168350477	12.83104431	1.55262E-07	1.785004195	2.535220674

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.710585387

Observation	Predicted Y	Residuals
1	273477.7262	-16533.72617
2	302176.656	-9761.655965
3	348163.8728	-16184.87282
4	372044.3478	-12601.34781
5	382811.1258	12168.87417
6	297234.8155	20483.18446
7	365971.6453	20862.35468
8	420234.2097	6752.790283
9	433727.7841	23096.21594
10	442990.2166	1024.783422
11	449302.9508	-5613.950759
12	480062.6494	-23692.64942

Appendix A.27

Table A.32. The regression analysis of the real imports of Poland in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.976437597
R Square	0.95343038
Adjusted R Square	0.948773418
Standard Error	7644.271041
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	11963505379	11963505379	204.7322666	5.49815E-08
Residual	10	584348797.6	58434879.76		
Total	11	12547854177			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-84942.89661	15213.03076	-5.583561747	0.00023295	-118839.6415	-51046.15172
X Variable 1	1.171183896	0.081852499	14.30846835	5.49815E-08	0.988805162	1.35356263

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.782022365

Observation	Predicted Y	Residuals
1	76228.73203	-4141.732035

2	89136.64255	-7439.642553
3	110471.0572	-9333.057239
4	125822.7367	-4910.736652
5	133036.0817	8929.918307
6	93114.80289	14040.19711
7	125600.036	8705.963966
8	150763.7419	527.2581238
9	158713.34	-3779.339962
10	160143.6366	-3824.636584
11	164751.402	3614.598036
12	177378.7905	-2388.790515

Table A.33. The regression analysis of the real imports of Poland, after eliminating the autoregression, in function of exports of the other EU countries (million of Euro)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.944686139
R Square	0.892431902
Adjusted R Square	0.880479891
Standard Error	5690.583195
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2417951919	2417951919	74.66792914	1.18963E-05
Residual	9	291444633.9	32382737.1		
Total	10	2709396553			

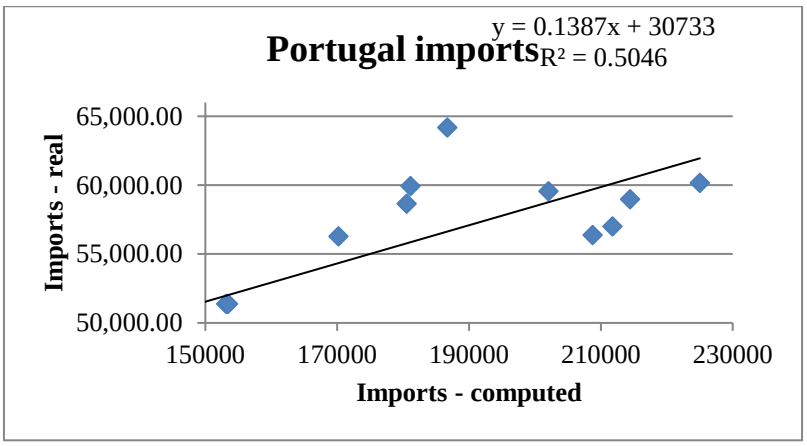
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 93.0%*	*Upper 93.0%*
Intercept	-20068.47485	9402.232871	-2.13443712	0.061575723	-39393.77596	-743.1737398
X Variable 1	1.000800811	0.115819209	8.641060649	1.18963E-05	0.762746604	1.238855018

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.436233874

Observation	Predicted Y	Residuals
1	45949.02735	-7557.807708
2	57553.48109	-5494.404303
3	59719.83899	434.1878135
4	58003.04456	11325.88475
5	20186.53508	1683.34536
6	68439.32694	1494.027587
7	73266.01888	-2658.444963
8	67141.38838	-3094.438965
9	64282.69985	-1039.258185
10	67485.89124	6972.520998
11	75910.87041	-2065.61239

Appendix A.28

Table A.34. The regression analysis of the real imports of Portugal in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.710324874
R Square	0.504561426
Adjusted R Square	0.455017569
Standard Error	3913.92976
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	156009226.6	156009226.6	10.1841369	0.009633532
Residual	10	153188461.7	15318846.17		
Total	11	309197688.3			

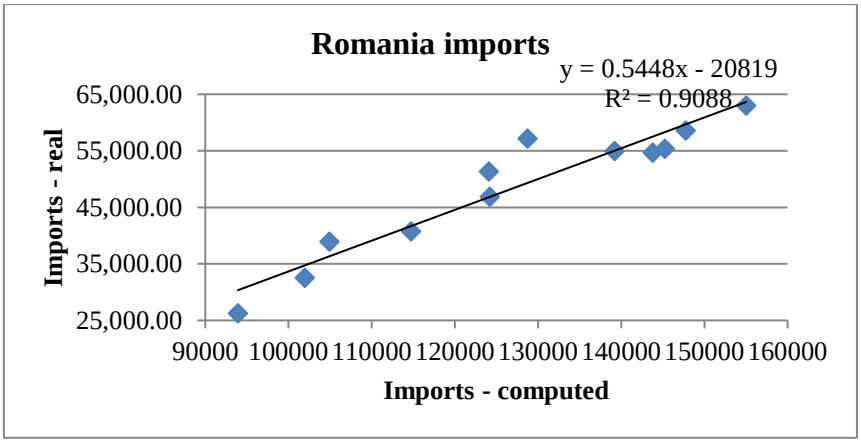
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	30732.58421	8154.668729	3.768710321	0.003669301	12562.84999	48902.31843
X Variable 1	0.138715782	0.04346741	3.191259454	0.009633532	0.041864358	0.235567206

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.039918627

Observation	Predicted Y	Residuals
1	50495.17893	-6322.178932
2	51974.93231	-602.9323121
3	54342.11436	1952.88564
4	55854.20794	4072.792063
5	56632.89037	7561.109633
6	52014.95043	-635.9504281
7	55773.32138	2873.678623
8	58758.184	792.8160046
9	59691.29871	-3317.298706
10	60104.24449	-3091.244492
11	60475.25234	-1499.252336
12	61946.42476	-1784.424757

Appendix A.29

Table A.35. The regression analysis of the real imports of Romania in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.953288032
R Square	0.908758071
Adjusted R Square	0.899633878
Standard Error	3603.9702
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1293648255	1293648255	99.59873542	1.61911E-06
Residual	10	129886012	12988601.2		
Total	11	1423534267			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-20819.13675	7008.614944	-2.970506572	0.014033656	-36435.304	-5202.969494
X Variable 1	0.544796841	0.054589318	9.979916604	1.61911E-06	0.423164261	0.666429422

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.705501918

Observation	Predicted Y	Residuals
1	30349.08694	-4114.086942

2	34722.73778	-2184.737775
3	41689.85584	-943.8558351
4	46783.76623	4521.233772
5	49324.4263	7823.573703
6	36341.67786	2606.32214
7	46851.00505	-1.00505436
8	55009.13073	-66.13072888
9	57515.93712	-2871.937122
10	58312.75698	-2984.756982
11	59670.89192	-1115.891924
12	63644.72725	-668.727251

Table A.36. The regression analysis of the real imports of Romania, after eliminating the autoregression, in function of exports of the other EU countries (million of Euro)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.920872471
R Square	0.848006107
Adjusted R Square	0.831117897
Standard Error	2732.474342
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	374910442.2	374910442.2	50.21290546	5.75365E-05
Residual	9	67197744.27	7466416.03		
Total	10	442108186.5			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 93.0%*	*Upper 93.0%*
Intercept	-8887.5794	4289.126845	-2.072118573	0.0681298	-17703.42867	-71.73012926
X Variable 1	0.572256413	0.080757523	7.086106509	5.75365E-05	0.406267814	0.738245011

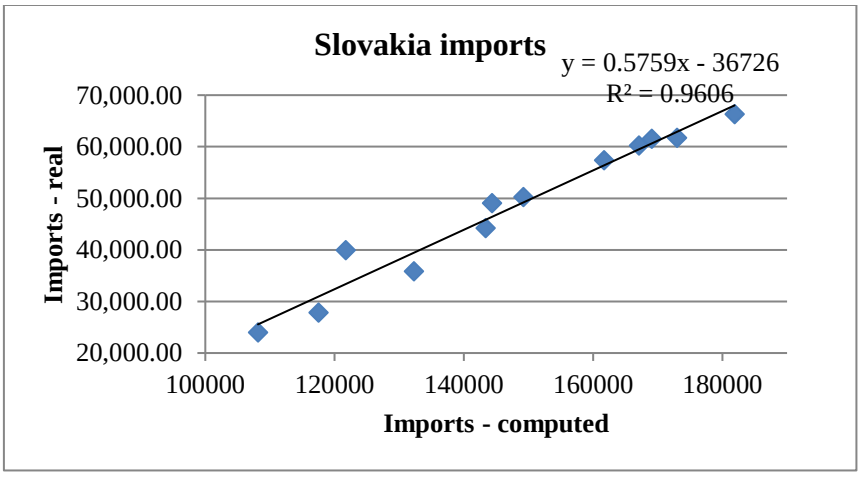
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.205288922

Observation	Predicted Y	Residuals
1	15823.32888	299.0445031
2	20267.01833	119.4749476

3	21038.52048	4771.10609
4	20359.25109	4686.453373
5	5052.27289	-1862.619747
6	24624.25362	-2144.591929
7	26286.2906	-658.0269061
8	23557.49695	-3292.142768
9	22746.87351	-1610.430617
10	23649.75083	285.7031652
11	26931.24259	-593.9701125

Appendix A.30

Table A.37. The regression analysis of the real imports of Slovakia in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.980105871
R Square	0.960607518
Adjusted R Square	0.956668269
Standard Error	2916.724438
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2074547738	2074547738	243.8555433	2.37367E-08
Residual	10	85072814.44	8507281.444		
Total	11	2159620553			

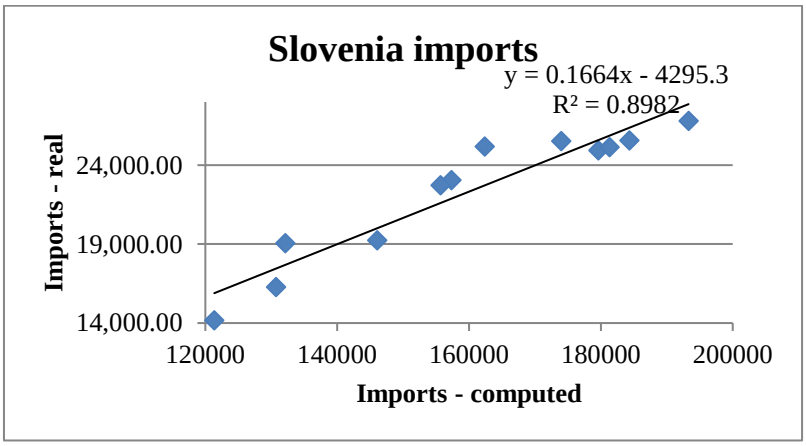
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-36725.87022	5502.185695	-6.674778398	5.53559E-05	-48985.50394	-24466.2365
X Variable 1	0.575900075	0.036879143	15.61587472	2.37367E-08	0.493728224	0.658071926

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.780158349

Observation	Predicted Y	Residuals
1	25554.62458	-1566.624577
2	30938.97354	-3101.973535
3	39438.83248	-3610.83248
4	45849.69453	-1620.694528
5	49212.56511	1040.434886
6	33379.64381	6518.356187
7	46406.68204	2643.317956
8	56397.15467	960.8453281
9	59487.12925	753.8707514
10	60625.33816	917.6618427
11	62897.3273	-1208.327303
12	68015.03453	-1726.034527

Appendix A.31

Table A.38. The regression analysis of the real imports of Slovenia in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.947756132
R Square	0.898241686
Adjusted R Square	0.888065854
Standard Error	1381.897333
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	168567893.3	168567893.3	88.27206816	2.80693E-06
Residual	10	19096402.38	1909640.238		
Total	11	187664295.7			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 83.0%*	*Upper 83.0%*
Intercept	-4295.3188	2858.475747	-1.502660572	0.163830389	-8522.308915	-68.32868483
X Variable 1	0.166358915	0.01770657	9.39532161	2.80693E-06	0.140175207	0.192542623

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 0.505807971

Observation	Predicted Y	Residuals
1	15892.93613	-1733.936133
2	17451.4713	-1178.471295
3	20006.4215	-779.4214984
4	21879.18037	1158.819629
5	22718.27145	2461.728551
6	17683.70002	1369.299977
7	21603.93123	1116.068773
8	24649.56371	875.4362943
9	25589.77106	-655.7710604
10	25865.74054	-736.7405379
11	26374.06019	-823.0601853
12	27862.95251	-1073.952515

Table A.39. The regression analysis of the real imports of Slovenia, after eliminating the autoregression, in function of exports of the other EU countries (million of Euro)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.927619251
R Square	0.860477475
Adjusted R Square	0.844974972
Standard Error	927.2219849
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	47720515.79	47720515.79	55.50571332	3.89126E-05
Residual	9	7737665.483	859740.6093		
Total	10	55458181.27			

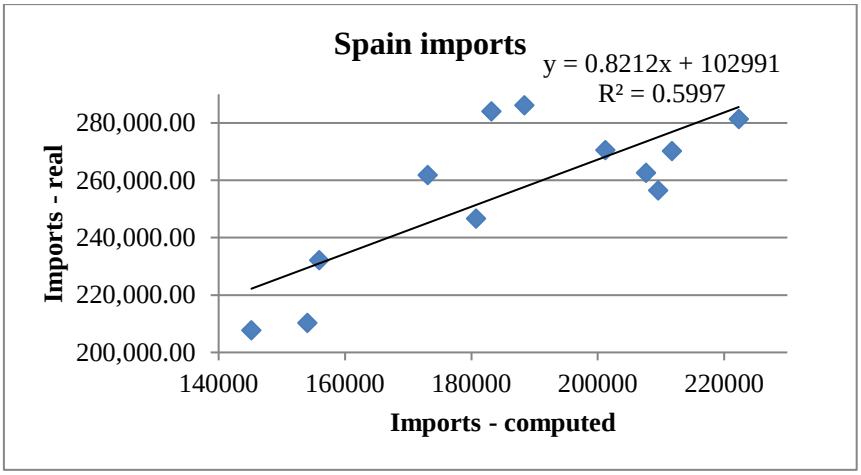
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 68.0%*	*Upper 68.0%*
Intercept	-1281.17168	1195.249742	-1.071886179	0.311671166	-2539.190547	-23.15281251
X Variable 1	0.169227716	0.022714472	7.450215656	3.89126E-05	0.145320382	0.19313505

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.226522174

Observation	Predicted Y	Residuals
1	6147.61545	-4.848084362
2	7612.322455	-28.04267918
3	7657.882782	1623.920956
4	7148.44916	1548.727234
5	1416.36757	-378.7117142
6	9068.364526	19.92967628
7	9313.372284	-43.67883512
8	8053.180852	-1381.359536
9	7649.6261	-359.9664848
10	7965.860862	-393.7164218
11	9110.473403	-602.254111

Appendix A.32

Table A.40. The regression analysis of the real imports of Spain in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.774374347
R Square	0.599655629
Adjusted R Square	0.559621192
Standard Error	17798.54832
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	4745012409	4745012409	14.97849534	0.003108117
Residual	10	3167883223	316788322.3		
Total	11	7912895632			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95.0%*	*Upper 95.0%*
Intercept	102990.7901	39817.34326	2.586581164	0.027108502	14272.22059	191709.3596
X Variable 1	0.821238971	0.212195151	3.87020611	0.003108117	0.34843871	1.294039231

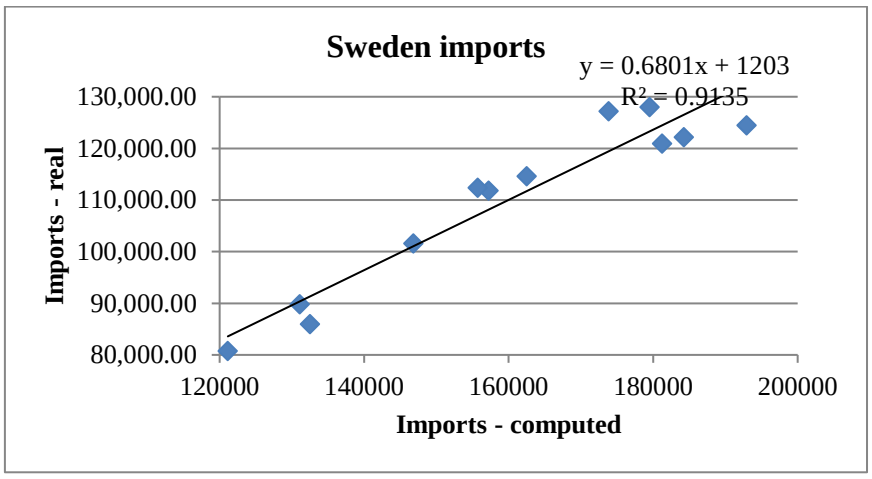
RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.13873941

Observation	Predicted Y	Residuals
1	222226.7144	-14570.71442

2	231022.1838	1086.816204
3	245120.886	16663.11405
4	253398.0878	30659.91216
5	257698.9492	28406.05082
6	229502.1197	-19280.11974
7	251419.0497	-4745.049742
8	268230.1071	2319.892879
9	273491.6784	-10930.67845
10	275098.0137	-18643.01366
11	276883.3051	-6710.305059
12	285553.9051	-4255.905051

Appendix A.33

Table A.41. The regression analysis of the real imports of Sweden in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.955752837
R Square	0.913463486
Adjusted R Square	0.904809835
Standard Error	5128.545564
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2776388481	2776388481	105.5581566	1.23988E-06
Residual	10	263019796	26301979.6		
Total	11	3039408277			

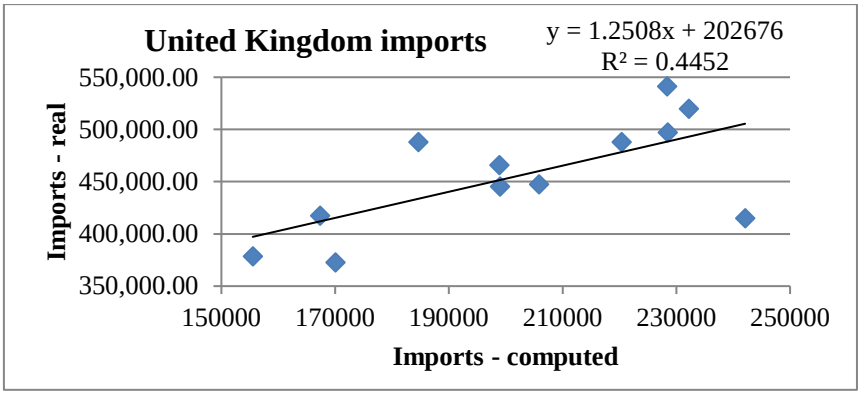
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 8.0%*	*Upper 8.0%*
Intercept	1203.006923	10687.89191	0.112557924	0.912608491	102.1643655	2303.849481
X Variable 1	0.680095947	0.066194863	10.27414992	1.23988E-06	0.67327794	0.686913954

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.116353987

Observation	Predicted Y	Residuals
1	83585.30052	-2862.300518
2	90360.1443	-579.1443047
3	101059.4273	523.5726533
4	108146.9929	3656.007148
5	111727.1947	2837.805258
6	91328.75055	-5383.750555
7	107120.184	5231.816009
8	119440.979	7733.021006
9	123298.5852	4686.41478
10	124455.1904	-3524.190393
11	126505.9449	-4373.944911
12	132412.3062	-7945.306173

Appendix A.34

Table A.42. The regression analysis of the real imports of United Kingdom in function of exports of the other EU countries (million of Euro)



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.667253679
R Square	0.445227472
Adjusted R Square	0.389750219
Standard Error	41803.54691
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	14024690012	14024690012	8.0254059	0.017762898
Residual	10	17475365342	1747536534		
Total	11	3039408277			

	Coefficients	*Standard Error*	*t Stat*	.	*Lower 8.0%*	*Upper 8.0%*
Intercept	202675.6936	90317.10797	2.244045432	0.048669026	1436.636311	403914.7509
X Variable 1	1.250750151	0.441506458	2.832914736	0.017762898	0.267012458	2.234487844

RESIDUAL OUTPUT DURBIN-WATSON STATISTIC: 1.473229489

Observation	Predicted Y	Residuals
1	397190.7061	-18897.70614

2	411983.4282	5375.571758
3	433595.0275	54355.97246
4	451395.5411	14319.4589
5	460149.654	-12921.65398
6	415386.2566	-42805.25663
7	451533.9866	-6242.986633
8	478353.5845	9551.415513
9	488300.3252	52811.67484
10	488451.4783	8525.521688
11	493092.3742	26640.62576
12	505473.6375	-90712.63754

Firm Characteristics and their Effects on Foreign Direct Investment

Evidence from Romania, Republic of Moldova and Republic of Turkey

Doina Prodan Palade[1]

Abstract: The purpose of this paper is to examine whether the firm accounting and financial performance ratios are reflected in the level of the Foreign Direct Investment and which one plays the most important role in attracting the foreign investors. the paper investigates the prior research works on this topic, underlining the influence of different factors on the level of Foreign Direct Investment. The sample is made of 25 randomly extracted firms listed on Bucharest Stock Exchange, for the fiscal year 2014. We constructed and tested a multiple linear regression model, using the level of Foreign Direct Investment as the dependent variable and 22 financial ratios, as independent variables. the authors found a positive effect of the financial ratios such as the net turnover to networking capital, equity multiplier, and net profitability ratio on the level of Foreign Direct Investment. the results of the research show that to enhance Foreign Direct Investment, corporations must improve their accounting and financial performance. The originality of this study results from the fact that it takes into consideration three different economic environments: Romania, Turkey and Moldova, respectively a European Union member country, a candidate to the European Union and a non-European Union country.

Keywords: foreign investors; accounting performance; financial performance; market value.

JEL Classification: M41; F21; G11

1. Introduction

Over the past decades, economic globalization has led to major changes in the world economy. A key element for economic development is the Foreign Direct Investment (FDI) and the most developing countries aim to attract investments from multinational enterprises. Growth in emerging countries is associated with a more open economy and a higher level of FDI. They serve as an engine of growth by supplying new capital, transferring technology and managerial know-how, marketing skills, organizational efficiency and focusing on profits. According to the National Bank of Romania, foreign direct investments are considered to be share capital and reserves due to a foreign investor who owns at least 10% of the

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vote or the subscribed share capital of a resident company's credits.

The paper is focused on three main parts. The introduction shows the importance, the topic, and the purpose of the research paper. The second part reviews the literature exploring the connections between financial performance and foreign ownership, and the influence of various factors like the firm value, firm size, and financial ratios upon the companies' ownership structure. The third part comprises our main findings, the empirical study, conclusions and future research.

2. Prior Work on FDI and its Main Determinants

The world economic system was restructured due to increased international capital flows following the foreign direct investment (FDI) and other forms of foreign investments and loans. Therefore, direct exports' sales are being replaced by foreign affiliates in host countries, leading to the replacement of international trade in foreign direct investment amount of international capital flows increased in the last three decades (Gurbuz & Aybars, 2010). The rapid expansion of FDI positively affects the performance of firms that have the internal resources and strong returns (Chang & Rhee, 2011). In the international flows of capital (which can take the forms of FDI, foreign portfolio investments and loans), direct exports are replaced gradually by the sales of foreign affiliates in the host countries, leading to the replacement of the international trade by FDI (Gurbuz & Aybars, 2010). Another role is played by the size of FDI convergence of domestic standards with the International Financial Reporting Standards. They increase firm value and promote FDI, reducing the costs of information processing for foreign investors. This effect consisting of reduced costs for information is stronger in partner countries whose accounting system show larger differences pre-convergence because they amplify the role of a convergence facilitator of accounting standard for FDI (Ding et al., 2011). When companies are expanding, managers should take into account the uncertainty of the market and competitive pressures they provide by the new market (Chang & Rhee, 2011). The prior research demonstrates that FDI improves firm financial performance up to a certain level, beyond which the foreign ownership does not enhance the firm profitability. For firms in a highly globalized industry, slow FDI expansion can pose a greater threat than rapid FDI expansion, because it does not allow firms to tap global scale economies (Chang & Rhee, 2011). Firm performance is traditionally analyzed relative to other firms in the same industry. The accounting earnings, like the return on total assets (ROA) and Earnings Before Interest and Taxes adjusted for total Assets, Earnings Before Interest and Taxes (EBIT), and market measures like return on market value of equity (ROE) and return on common stock adjusted for market return (STKRET) can be used for measuring the firms' financial performance (Furtado & Karan, 1994). Firm performance can be measured using ROE (Return on Equity) and PM (Profit Margin) (Yasser et al., 2011). Industry and size adjusted Chief Executive

Officers (CEO) pay is negatively related to future shareholder's wealth changes for periods up to five years after sorting on pay (Cooper et al., 2013). A firm's ability to introduce new products may be hampered because of the need to clear the distribution channel of excess inventory (Singhal, 2005). Gurbuz and Aybars performed an empirical analysis on 205 non-financial companies listed on ISE, covering the period from 2005–2007, to examine the effect of FDI on the firm performance. They concluded that minority foreign ownership (up to 50%) improves performance in terms of ROA (Return on Assets) and major foreign owned firms (over 50%) display worse performance than the minority foreign owned and domestic firms (Gurbuz & Aybars, 2010). The results are robust to the findings of previous works. Based on quarterly institutional holdings data from the first quarter of 1980 to the fourth quarter of 2011 from the Thomson-Reuters Institutional Holdings (13F) Database, Switzer and Wang found that the concentrated ownership has a negative impact on firm's credit risk and bondholder wealth, being positively related to firms' credit risk. At the same time, investors with large stock ownership, have both the incentives and the ability to play an active role in monitoring, information-gathering, and intervening in portfolio investment policies and capital structure decisions. They can play an important monitoring and informational role to reduce managerial opportunistic behaviour and agency conflicts between management and shareholders (Switzer & Wang, 2013).

Other indicators that may have a significant influence upon the level of FDI are: the operating performance, the capital structure, firm size and ownership characteristics, and the less wealthy investors. Firm size and ownership characteristics are significant in keeping the share price stable and increasing over the time period. Economic value added (EVA) is a good predictor for abnormal returns (Basar & Tosunoglu, 2006). Kahle and Kuldeep suggest that capital structure may be related to the debt-equity choice made by firms, size, profitability, growth, collateral value of assets, non-debt tax shields from operations, and uniqueness (Kahle & Kuldeep, 2005). Using a sample of 56 firms listed on Colombo Stock Exchange and covering the period of 2006–2009, Munasinge & Fernando found that less wealthy investors have a significant influence in keeping the share prices and firm size stable (Munasinge & Fernando, 2011).

3. FDI Confidence Index

FDI Confidence Index shows how changes in countries' political and economic systems can affect the FDI inflows. The top 25 of the Index in 2015 is dominated by Europe. Membership of the European Union (EU) is vital not only for accessing to the single market of the EU, but also having access to the structural funds of Europe, not forgetting economic growth and political stability (Basar & Tosunoglu, 2006). The United States is ranked 1st, followed by China and the United Kingdom.

This means that the corporations are most likely to invest in these countries. From among the countries which were taken into consideration in this research paper, Romania, Republic of Moldova and Turkey, only Turkey is included in this top 25 for the year 2014. Turkey moved up to 22nd from the 24th place in 2014. As for the year 2016, Turkey together with Finland and Poland do not appear in the Index.

4. The Dynamics of FDI in Romania, Moldova and Turkey between 1998–2014

According to the United Nations Conference on Trade and Development (UNCTAD), for the three countries analysed in this research paper, the level of inward and outward FDI inflows in Turkey has a higher level than in Romania and Moldova (see Figure 1 and Figure 2), the highest level of FDI inflows being registered in Turkey during 2006 with an amount of $22,047.00 million (UNCTAD, World Investment Report, 2014). In 2014, the level of FDI in Turkey was at $12,146.00 million, meaning 0.989 percentage of total world FDI.

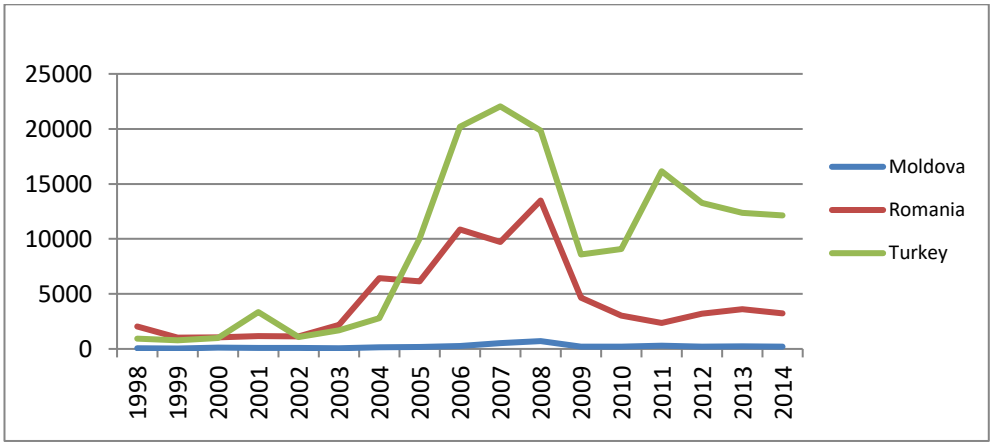

Figure 1. Inward FDI inflows in Romania, Republic of Moldova and Turkey, 1998-2014

Source: UNCTAD. World Investment Report. Web page. Retrieved from http://unctad.org/en/PublicationsLibrary/wir2014_en.pdf

Measure: US Dollars at current prices and current exchange rates in millions

For the period 1998–2014, both Romania and Moldova registered the highest level of FDI in 2008, with the amount of $13,491.54 million USD in Romania and $711.46 million USD for Moldova. During 2014 the level of FDI in Moldova was of $207.39 million USD, 12.23% down from 2013.

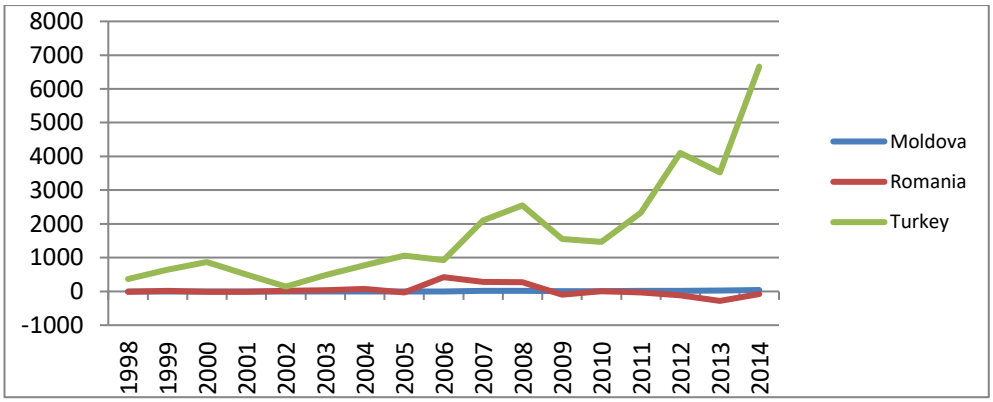

Figure 2. Outward FDI inflows in Romania, Republic of Moldova and Turkey, 1998–2014

Source: UNCTAD. World Investment Report. Web page. Retrieved from http://unctad.org/en/PublicationsLibrary/wir2014_en.pdf

Measure: US Dollars at current prices and current exchange rates in millions

4.1. FDI in Romania

For Romania, the number of companies with foreign participation increased between 2010 and 2014 by 2.3 times and the amount of capital held by foreign investors grew more than 6 times. Some caused profound changes in the capital structure of Romanian companies like access to resources, new markets and lower transaction costs (UnData. Romania, Country Profile, 2012). For the financial year 2014 the net flow of FDI (see Figure 3) reached a level of €2,421 million. The contribution of foreign direct investors in companies that benefit from foreign direct investment in Romania to the equity was of €43,243 million, 71.80% from the total FDI stock.

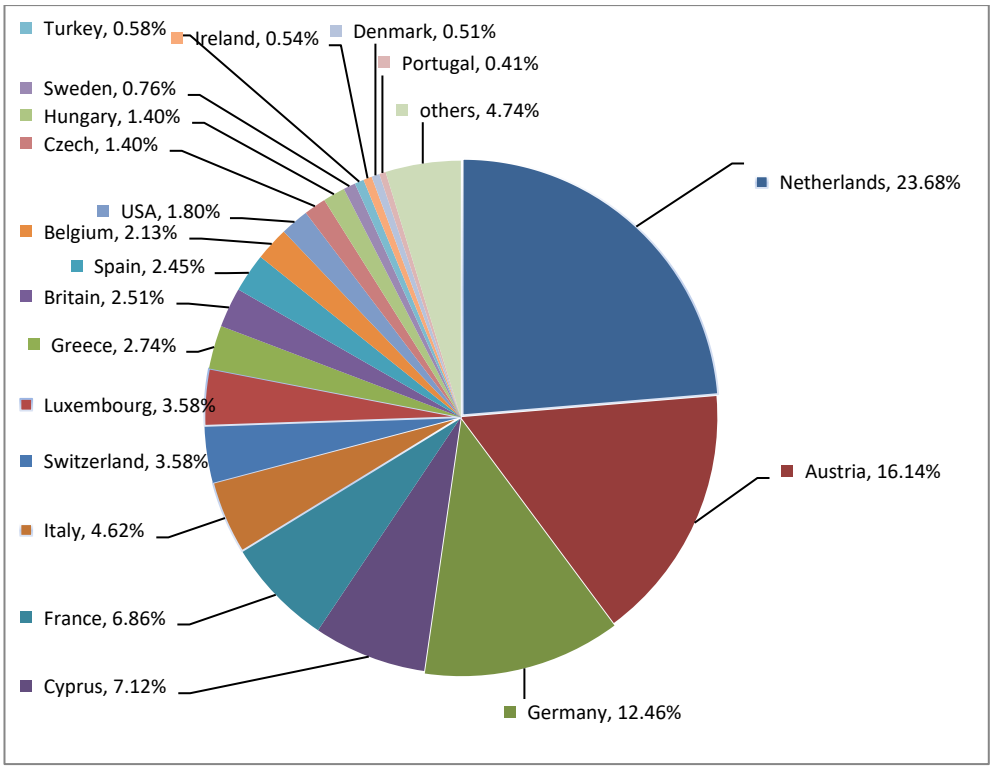

Figure 3. Foreign Direct Investments in Romania 2014, by country (% of total FDI flow)

Source: the National Bank of Romania (BNR), Retrieved from www.bnr.ro accessed on June 2016

Due to the repayment loans, the net credit of FDI enterprises loans from their FDI investors was negative and stood at -€425 million. The primarily net flow came from manufacturing and in 2014 its amount was of €929 million. The first four countries by the share of total FDI in Romania on 31 December 2014 are:

- Netherlands (23.68%);
- Austria (16.14%);
- Germany (12.46%);
- Cyprus (7.12%).

It is noted that the Netherlands is ranked first in terms of FDI in Romania, Moldova and Turkey. Also, Germany is found in the first four largest foreign investors in Romania and Moldova.

4.2. FDI in Turkey

The first four countries by the share of total FDI in Turkey (see Figure 4) on 31 December 2014 are:

- Netherlands (23.54%);
- United Kingdom (12.26%)
- Azerbaijan (10.31%)
- Russia (8.43%)

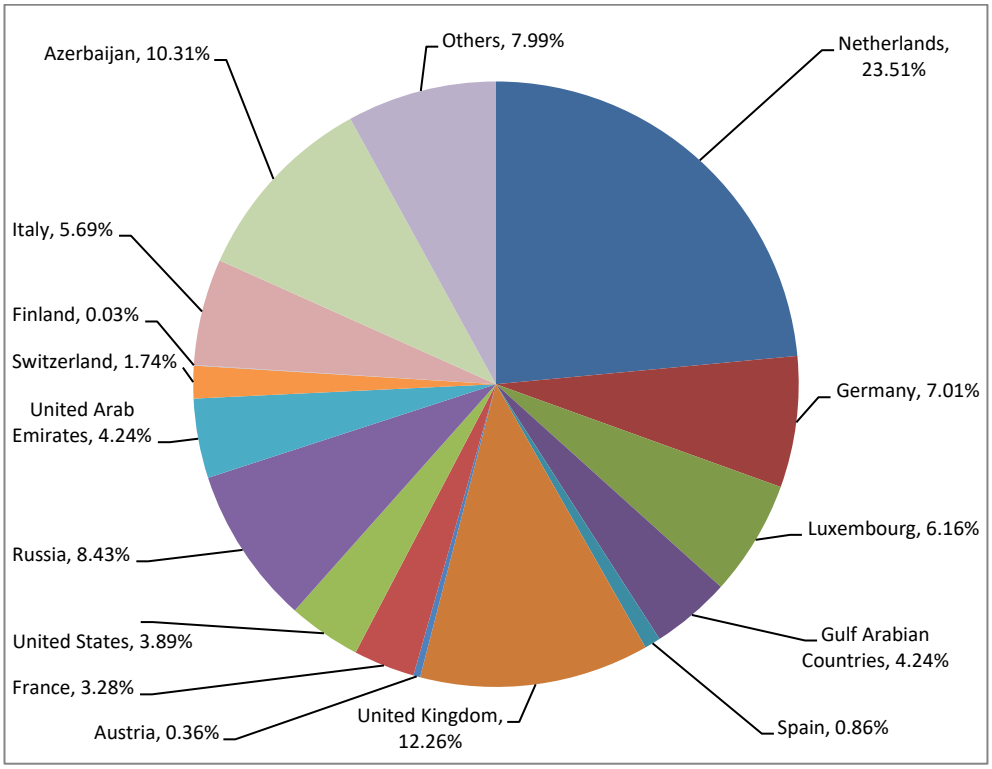

Figure 4. Foreign Direct Investments in Turkey 2014, by country (% of total FDI flow)

Source: the Central Bank of the Republic of Turkey, retrieved from http://www.tcmb.gov.tr/yeni/eng/ accessed on June 2016

Turkey is placed between Europe and Asia, being a bridge between the two continents. Its geographical location, the positioning advantage at the intersection of many trade routes and the extensive infrastructure of ports and railways accelerate the level of its international trading. Due to the size of its economy, Turkey plays an important role among the developing countries. Over the last

decade Turkey has undergone a deep economic transformation, becoming the 6th largest economy in Europe (Investment Support and Promotion Agency of Turkey, 2014). OECD projects a growth rate of 3.8% in 2014 and 4.1% in 2015 for GDP in Turkey.

The European Community (EC) - Turkey Customs Union and Euro-Mediterranean Partnership (EUROMED) trading partnerships have led to a rapid progress of its international trade volume and FDI. According to Ministry of Economy from the Republic of Turkey, the main objective of FDI law in Turkey is to protect the rights of the foreign investors. They are encouraged to make direct investments in Turkey and they receive equal treatment with the domestic investors. As for 2013, Turkey had free trade agreements (FTAs) with 31 countries and meanwhile there are 14 countries/country blocs that Turkey has started FTA negotiations with. In 2013, Turkey was the 8th largest recipient of FDI jobs in Europe. In the top 15 countries by FDI projects, during 2013, Turkey is ranked 11, having a successful year, with 98 projects started, representing an increase by 3% from 2012, including mainly manufacturing projects in the automotive sector (EY's attractiveness survey Europe 2014. Back in the game, 2014). The 2014 Foreign Direct Investments Evaluation Report from YASED, International Investors Association showed that during that period, the total gross capital inflows of $10,189 million were distributed among the sectors, as follows: 52.4% services, 47.2% industrial and 0.4% agricultural. Similar to previous periods, the Eurozone had the most active foreign investors, with 49 deals. At the top of the list were Netherlands, Germany, and Luxemburg (see Figure 4).

4.3. FDI in Moldova

For the 2014 period, the main investors in Moldova are (see Figure 5):

- Russian Federation (25.8%)
- Netherlands (11.51%)
- Cyprus (8.70%)
- France (7.77%)

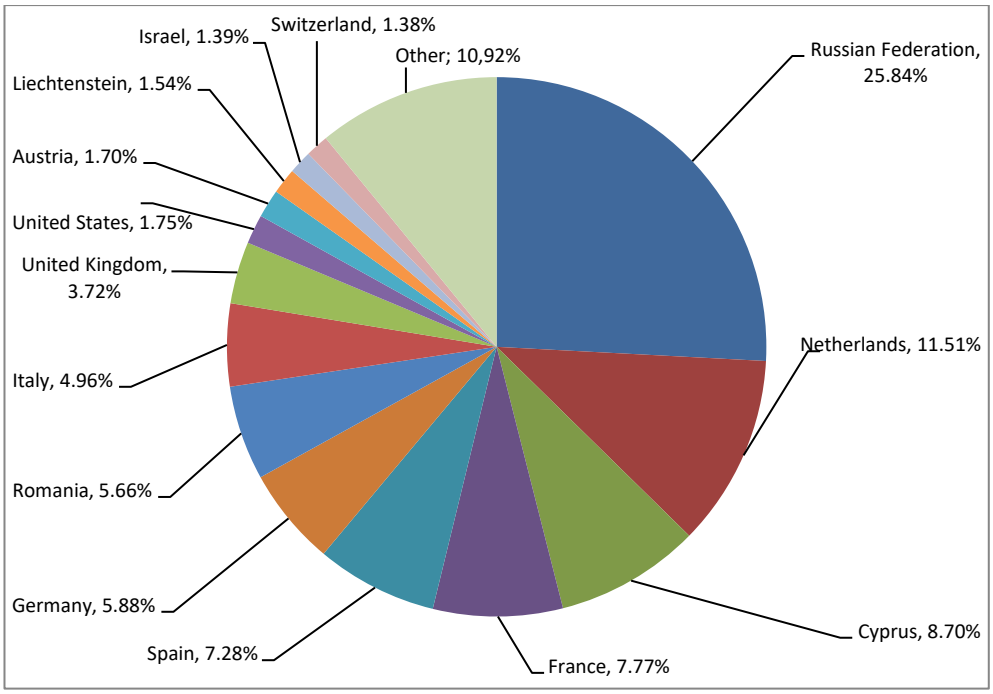

Figure 5. Foreign Direct Investments in Moldova 2013, by country (million $)

Source: the National Bank of Moldavia (BNM)

The process of privatization which took place in the South-Eastern Europe was faster than in Moldova, attracting higher levels of FDI. Due to the long period of transition from the communist system to the free market that took place in Moldova ranked it among the last European countries for FDI. Regarding the dynamics of FDI in Republic of Moldova, we can say that since 2005 they have had a positive trend, mainly due to increased FDI flows from the European Union to the Republic of Moldova, as a consequence of improving the country rating and economic performance (Ulian & Turliuc, 2014). Two thirds of the foreign capital present in the Republic of Moldova is invested in joint venture companies, while the rest belongs to companies in foreign ownership.

According to the 2014 Investment Climate Statement, Moldova continued to take steps toward developing a stronger economy, by reforming its regulatory framework, combating corruption and trying to improve the business climate. Moldova, ranked as one of the poorest countries in Europe, must rely on FDI for economic growth. The country profited from increased inflows of foreign direct investment (FDI) with eastward expansion of the EU, which became the country's immediate neighbour following Romania's accession to the EU on January 1, 2007.

6. Research Methodology

The sample is made of 25 firms listed on Bucharest Stock Exchange for the fiscal year 2014. In order to test the relationships between the FDI and the financial performance indicators of the firms, we use a linear regression model showed in the following equation:

$$y = \alpha + \beta_1 R_1 + \beta_2 R_2 + \beta_3 R_3 + \beta_4 R_4 + \beta_5 R_5 + \beta_6 R_6 + \beta_7 R_7 + \beta_8 R_8 + \beta_9 R_9 + \beta_{10} R_{10} + \beta_{11} R_{11} + \beta_{12} R_{12} + \beta_{13} R_{13} + \beta_{14} R_{14} + \beta_{15} R_{15} + \beta_{16} R_{16} + \beta_{17} R_{17} + \beta_{18} R_{18} + \beta_{19} R_{19} + \beta_{20} R_{20} + \beta_{21} R_{21} + \beta_{22} R_{22}$$

Where:

- Y is the dependent variable representing the level of FDI (as percentage of total shareholders' equity)
- α is the random variable error (residue)
- R_i, i = $\overline{1,22}$ are the financial statement ratios (see table 1), for the fiscal year 2014.

This model relates the level of foreign equity of the firms to their financial performance ratios.

Table 1. Financial statement ratios

Category	Code	Financial variables (%)
Asset/active balance sheet structure analysis	R1	Fixed assets ratio = fixed assets/total assets
	R2	Tangible assets ratio = tangible assets/total assets
	R3	Current assets ratio = current assets/total assets
	R4	Inventory ratio = inventory/total assets
Passive balance sheet structure analysis	R5	Current resources ratio = short term liabilities/total passive
	R6	Overall debt ratio = total liabilities/total passive
	R7	Overall financial autonomy ratio = shareholders' equity/total passive
Liquidity measuring ratios	R8	Current ratio = current assets/current liabilities
	R9	Acid test ratio or Quick ratio = (current assets – inventory)/current liabilities
	R10	Cash flow ratio = net cash flow/current liabilities
	R11	Net turnover to networking capital = Net turnover/networking capital
	R12	Networking capital to total assets = Networking capital/total assets
Solvability measuring ratios	R13	Overall solvability = total assets/total liabilities
	R14	Financial leverage or overall debt ratio = total debts/shareholders' equity
	R15	Long term debt ratio = long term liabilities/

		shareholders' equity
	R16	Equity multiplier = total assets/ shareholders' equity
Profitability ratios	R17	Net profitability ratio = after-tax profit/net turnover
	R18	Return on assets (ROA) = net income + interest expense(1-tax rate)/average total assets
	R19	Return on equity (ROE) =net income/total assets
Price to book ratio	R20	P/BV = price/book value
Intern sales ratio	R21	Domestic sales/total sales
Exports ratio	R22	exports/total sales

Source: (Mironiuc, 2013)

6.2. The Sample

The sample used in this empirical study is made of 25 companies listed on Bucharest Stock Exchange (BSE) in the year 2014, for which the financial statements and the annual reports were available on the BSE online database.

6.3. Results

Model Summary (see table 2) displays the correlation coefficient R square and the adjusted R square between the dependent variable Y and the independent variables that were included in our tests. R square and the adjusted R square can take values between -1 and 1. In our case, R is equal to 0.713 and R square is 0.509, showing that between the dependent variable and the independent variables there is a linear strong correlation.

Table 2. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.713[a]	.509	-1.359	45.32676
a. Predictors: (Constant), R22, R13, R19, R11, R4, R17, R18, R10, R15, R21, R3, R5, R2, R14, R9, R8, R7, R6, R16				
b. Dependent Variable: Y				

Source: SPSS

Table 3. Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	R1	.[b]	.	.	.	.000
	R12	.[b]	.	.	.	.000
	R21	-84843.385[b]	-1.499	.208	-.600	2.456E-11
a. Dependent Variable: Y						
b. Predictors in the Model: (Constant), R22, R13, R19, R11, R4, R17, R18, R10, R15, PBVR21, R3, R5, R2, R14, R9, R8, R7, R6, R16						

Source: SPSS

Applying statistical tests by using Enter method, three variables were excluded from the model, respectively R1, R12 and R21, showing that they don't explain the level of Y (see Table 3). The estimated equation of multiple linear regression model is as follows:

$$y = -26.76 + 94.278R_2 + 12.855R_3 + 177.284R_4 - 86.391R_5 - 75.810R_6 - 225.067R_7 + 4.241R_8 + 34.596R_9 + 1.195R_{10} + 1.892R_{11} - 22.660R_{13} - 197.424R_{14} + -1.676R_{15} + 182.449R_{16} + 2.132R_{17} + 447.353R_{18} - 143.990R_{19} + 5.739R_{20} + 175R_{22}$$

The positive values of the coefficients show a direct correlation between those financial ratios and the level of FDI, such as the tangible assets ratio, current assets ratio, inventory ratio, current ratio, acid test ratio, cash flow ratio, net turnover to networking capital, equity multiplier, net profitability ratio, return on assets ratio, price per book value ratio and the level of exports as percent of total sales. The coefficient β_{14} is -197.424 meaning that the dependent variable decreases by 1% if the financial leverage increases by 1%, while the other variables remain unchanged. Figure 6 and Figure 7 show a normal distribution of the errors for the tested regression model.

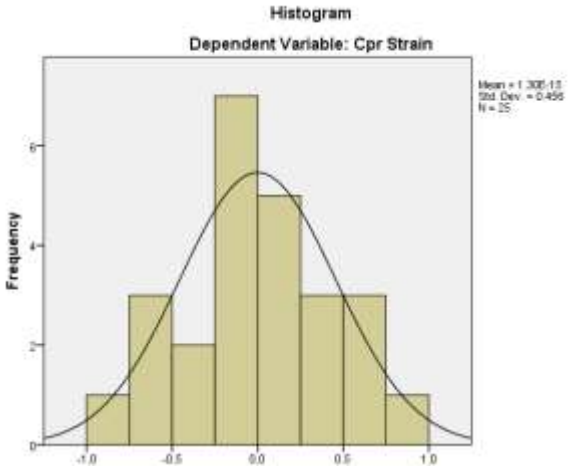

Figure 6. Regression Standardized Residual

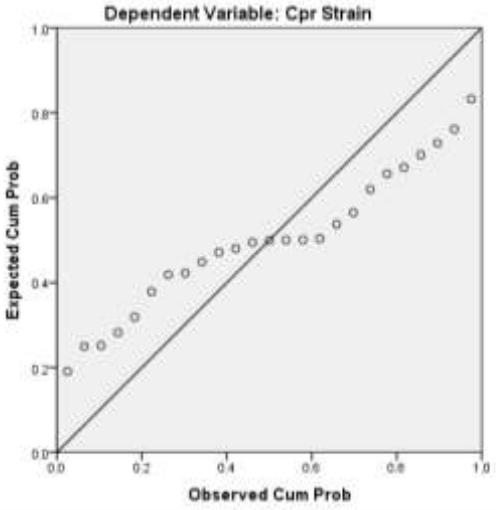

Figure 7. Normal P-P Plot of Regression Standardized Residual

Source: SPSS

The proposed model is validated by the empirical results and it shows a direct correlation between the financial performance ratios and the level of FDI for the analyzed sample. The fixed asset ratio, networking capital to total assets ratio and the ratio of domestic sales have no influence on the level of FDI and were excluded from the regression model.

7. Conclusions and Future Work

We conclude that FDI is one of the main channels for bringing advanced technology to the developing countries. It facilitates the transfer of technology and know-how with positive impact for the whole economy. The technological effect of FDI is country-specific and its impact can differ, depending on the type of activity, the sector, the research and development activity and the level of labour force skills. Regarding the effects of FDI on productivity, no consensus has been reached in spite of the amount of empirical work. The prior work shows the positive impact on firms' productivity, while few works show the negative impact of FDI on domestic owned firms' productivity (Filiz, 2014). The presence of foreign ownership up to a certain level in the ownership structure improves the firm financial performance. Numerous studies investigated the relationship between FDI and firm performance, but there is no consensus. The results of the empirical study show that the most financial performance ratios are significant in attracting a high-level foreign ownership. As for Romania, Turkey and Moldova, the most active foreign investors come from the Eurozone. Among the main investor countries we found Netherlands, Germany, Austria, Cyprus and France. This paper adds new empirical evidence to the work that addressed the connection between FDI and firm performance and it provides new empirical results showing that performing companies are more likely to attract the foreign investors. Future research should aim to study the specific determinants of FDI, such as the cultural distance factors, parent-country GDP per capita, corporate governance indices, and regional trade agreements.

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Analysis of E-CRM Services of Banks: from the View of Bankers

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Abstract: In this article the researcher has analyzed the E-CRM services of banks in Virudhunagar District in the point of view of employees. The main objective of the study is analyzing the opinion of bank employees about e-CRM services of banks in Virudhunagar District and also offers suitable suggestions on the basis of findings of the study. The data required for the study has been collected during the year 2014. This study is both descriptive and analytical in nature. This study covers both Primary data and Secondary data. The Primary data have been collected from 83 bank officials in Virudhunagar District with the help of pre–tested interview schedule and questionnaire respectively. The Secondary data have been collected from the records of banks, published books, journals, reports and circulars issued by the Reserve Bank of India, encyclopedia and through web sites. The researcher has used the percentage analysis throughout the report to express the opinion of the respondents and in order to test the opinion of the bank employees about the e-CRM services with the help of Kolmogorov Smirvo Test.

Keywords: E-CRM; Services; Banks

JEL Classification: G20; G21; G29

1. Introduction

The advancement in information and communication technology has made the new millennium an e-millennium. The dividing line between the banking and non–banking financial institutions like mutual funds is getting blurred. Competition from players in the market has resulted in products and services which were traditionally offered by banks and financial institutions but are now being offered by non–banking financial organizations more efficiently and effectively. In India, the monopoly of banks over payment system has been broken by the launching of satellite – based money order service by the Postal and Telephone Departments.

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Now, banking activities are not only confined to borrowing and lending, but also to a large number of other services keeping in mind the requirement and convenient of customers. In the fast changing banking environment World Wide, banks in India will not only have to learn the new rules but also upgrade the skills, as well as the tools of banking. The challenge lies in addressing these issues and at the same time keeping the wheels of growth moving.

In the early 1990s, the concept of relationship marketing was formally introduced into the services of marketing literature. Financial service institutions, airlines and other service providers found it profitable to retain and reward existing customers rather than run after new customers. It has been established that building closer relationships with the customers resulted in better returns to organizations through the following means:

1. Increasing use of services by loyal customers
2. Changing of price premiums for customized services
3. Referrals by satisfied customers that brought in new customers.

The Customer Relationships Management (CRM) is a well–reflected series of functions, skills, processes and technologies which together help organizations to more profitably manage customers as tangible assets. CRM recognizes that success over a period stems from customer loyalty and that long–term profitability lies in fostering unique lifetime relationship with small number of carefully chosen customers. It calls for increasing customer share that is, retaining customers and selling them new customer made, higher margin products over time and also to increase the profitability of each customer and therefore, of the organization as a whole. The concept of CRM when seen in the context of e-business or transactions over an electronic media translates into e-CRM, which essentially deals with managing customer interaction over the web. After the adaptation of Internet and availability of electronic channels of communications, it has become possible to capture customer–related information intelligently at the stage of interaction itself. E-CRM applications are the generic of application systems, which handle customer interactions over this new electronic channel of communications. (Vernekar, Goel, & Bhardwaj, pp. 55-64).

2. Related Work

The available literature in the field of customer relationship management in banks is extensive and keeping track of all of them and making a review is a formidable job. But efforts were made to present an evaluation of the earlier studies and research works done relating to the present study.

Haverty (1998, pp. 40-44) demonstrates E-CRM providing cost savings, opportunism and threats drive action and innovation even in conservative banks. They have influenced how banks must re-position themselves to take advantage of new service delivery channels and new markets for existing services. (Loans, letter of credit and so on) Many banks have already built web sites on the Internet, offering banking services. Leveraging the power of the web is a move form static pages to dynamic applications that are connected to bank data. A web service gives real-time access to merchants for payment information rather than waiting for hardcopy from bank. Elias Awad (2000, pp. 14-33) has analyzed the most popular tool for customer service is e-mail. Inexpensive and fast, e-mail is used to disseminate information (e.g. catalogues), to send product information and order confirmations, to conduct correspondence regarding any topic with customers and business partners and responding to enquiries from customers, To answer a large number of e-mails quickly and cost-efficiently automated e-mails quickly e-mail reply systems are increasingly implemented. Automated e-mail reply response to customer inquiries is developed using intelligent agents that recognize key words and quickly respond to common queries. However, the greatest advantage of e-mail as a communication tool is that of providing quick and accurate information to all customer queries. E-mails can include forms, reviews, referral and new contacts sent to customers as attached files and how e-CRM bringing bridge between bank and customer through e-mail business communication. (Sims, 2000) has pointed out that e-CRM systems support all stages of the interaction with the customer for example order delivery and after-sales service. E-CRM systems cover online banking, e-mail, knowledge bases that can be used to generate customer profiles and customer personalize services and the generation of automatic help through customer e-bank interaction. (Singh, 2002, pp. 434-446) has indicated that faster processing of the transaction by e-CRM, the fact e-response to customer queries, order acknowledgement, delivery and payment information via e-mails or automated responses are greatly appreciated by customers. It has also been highlighted that the nature of e-response also helps strengthen the relationship between the supplier and the customer and makes up for the personal response that prevails in the traditional shopping area. One of the business respondents emphasized that "via e-mail order acknowledgement, we recognize and address our customers by their first names", strengthening e-relationships with this service. Another business viewed that "a close relationship with customers can be developed from a distance with e-responses". E-mail responses were widely used business to acknowledge receipt of order, payment and delivery of information. An e-response to say thank you, an apology for any delays, tailored e-mails from analysis of shoppers profile to provide online shopping guidance and to announce the release of new products and special supported online shoppers. Customer responses confirmed the value of e-responses in the B2C e-space, e-CRM how timely responds to customer for their requirements. (Singh, 2002, pp. 434-446) say that the fact that e-response to customer queries, order acknowledgement, delivery

and payment information via e-mail or automated response are greatly appreciated by customers. Further he explained that online business organization investigated that secure transactions and transmission of information are important services offered to customers. It was emphasized by one of the respondents that many potential web shoppers abort their transactions due to security fears. (Aihie & Eddine, 2007, pp. 139-164) have studied that a CRM is an idea, which has its heredity line in the technology. In the earlier days relationship marketing's sole aim to get information about the preferences of the customers and the information, which was stored by them in their databases so as to protect and deal with one to one relationship with customers CRM, was developed. Once when the organization acquires the customers and is able to have them lastingly forever, this implies that the customer becomes more loyal and making good use of the services of the organization. Trust, co-operation and satisfaction have to be soon as the face of assurance between both the parties, for a long lasting relationship with customers. Organizations need to be in constant touch with their customer's in order to buildup long-term relationship. **(**Sudalaimuthu & Lilly, 2007, pp. 73-91) have observed that the demographic factors such as sex, educational qualification, occupation, marital status and income of the respondents have a direct impact on the customer's perception of the service rendered by the banks and have a significant relationship with the respondent's frequency of transaction and with the respondent's opinion on e-banking services. (Selvakumar & Ramar, 2010, pp. 24-26) have studied that the customer relationship management in banking sector. The study concludes that a customer is the King under the customer relationship management concept. CRM helps the banking to develop an enduring relationship with customers thereby ensuring profitability, service at the right time, the used of innovative method creation of a large customer base, installation of a simple and customer friendly system and welcoming customers complaints are some of the quality services which should be provided by the bank, in order to ensure a better life-long-term relationship with the customers. Implementing the CRM concept will attract more customers and consequently more revenue to the bank. (Selvakumar & Ramar, 2012, pp. 28-32) have presented e-CRM techniques used by banks in India. The article concluded that maintain and managing the customer relationship will become more competitive by added development and development of e-CRM convenience, customer interaction and satisfaction are more advantage provided by the online banking industry through the usage of e-CRM. The usage of e-CRM has speeded up the transactions with a better rate of accuracy and trust in the banking industry.

There are many research work carried out on customer relationship management in banking sector but in case of electronic customer relationship management in the banking sector is less one. Particularly in this study, the researcher has concentrated electronic customer relationship management services of banks from the view of employees.

3. Statement of the Problem

The process of globalization and liberalization has exerted its huge influence on the Indian banking sector. In banks, the service sector, the customer service should not only be considered as a function, but a way of life also. The success of a bank depends on how much it fulfills the customer needs. Therefore, the bank should be customer-oriented to meet challenges of to-day's competitive environment.

Customer needs and expectations change from time to time, since it is highly dynamic with respect to societal influence. To-day's customers are aware of their needs. Entry of new branches of foreign banks in India and their better services to customers have broadened and enlarged the customers' expectations of services from Indian banks. So, it is the time for Indian banks to innovate new products and services and also to refine the existing services.

A way to remain competitive in the more and more complex banking environment is the use of CRM concept. The CRM is a business strategy geared towards acquiring, retaining and growing more profitable customers. The basic approach of CRM in a banking context is to centre all operations of a bank on its customers, creating a "CRM State of Mind" in an enterprise wide manner. To-day, Indian banks are also trying to develop service quality with customers. They are continuously involved to redefine and to provide new ideas and techniques to the customers. They are searching new concepts for maintaining and enhancing the relationship with customers and getting feedback from them about the product offerings and suggestions on improvement of the products.

With the implement of e-CRM services, banks can expect several advantages such as streamlined processing, reduced transactions cost, better security and operational control, multiple delivery channels for the customers, time to market, easy latent of new products and the like. At the same time the banker has to take lot of initiation and implementation steps to get success in that issue and the evaluation of the e-CRM services from the point of view of bankers gives the real position of the e-CRM. Therefore, a sincere attempt has been made by the researcher to analyze the efforts taken by the bankers to implement of e-CRM services and to what extent the e-CRM is beneficial to the customers. Thus, the complete evaluation of the electronic customer relationship management in banking sector is being undertaken from the point of view of bankers. Particularly, this study is focused on Virudhunagar District, as this is an important industrial as well as commercial centre in Southern part of Tamil Nadu, India.

The researcher has recorded the opinion of bankers about e-CRM services of banks in Virudhunagar District by means of implementation of e-CRM services, users of e-CRM services, performance of e-CRM services.

4. Concepts and Terms

Customer Relationship Management (CRM)

Customer Relationship Management (CRM) is neither a product nor a service, but a business strategy to learn more and more about the customers' behaviour and requirements in order to create a long-term term relationship with them.

Electronic Customer Relationship Management (e-CRM)

E-CRM or web-based CRM system is fundamentally less cumbersome and less expensive to implement than traditional CRM because e-CRM can be extended more easily to users everywhere in the company through the internet. The value of e-CRM goes beyond mere cutting of costs. The adoption of technology allows companies to capture customer feedback at more of the "touch points" between a company and its customers.

5. Solution Approach

Scope of the Study

This study is mainly planned to analyze the view of bank employees about e-CRM services of banks in Virudhunagar District.

Objectives of the Study

The present study has been undertaken with the objectives of analyzing the opinion of bank employees about e-CRM services of banks in Virudhunagar District and to offer suitable suggestions on the basis of findings of the study.

Hypothesis of the Study

In this study, the hypothesis that there is no significant difference in the opinion of the bank employees about the e-CRM services has been framed.

Methodology

The data required for the study has been collected during the year 2014. This study is based on both primary and secondary data. The primary data have been collected from the bankers (employees of banks in Virudhunagar District) with the help of pre–tested interview schedule and questionnaire respectively. The secondary data have been collected from the records of banks, published books, journals, reports and circulars issued by the Reserve Bank of India, encyclopedia and through web sites.

Sampling Design

There are 131 branches of 15 public sector banks and 8 private sector banks in Virudhunagar District. The opinion of the bank officials connected with the banking system on the implementation of e-CRM services of banks has been collected by means of questionnaire. It is decided to collect the opinion from one employee, who is responsible for CRM activities, per branch. Therefore all the 131 branches are contacted with questionnaires. Only 83 bank employees ready to give their opinion. Therefore, the researcher has collected the opinion from 83 bank officials about e-CRM services.

Plan of Analysis

The data are analyzed by using appropriate statistical techniques such as ***Percentage, and K.S. Test.*** The ***Percentage Technique*** has been used throughout the report to express the opinion of the respondents.

For the purpose of analysis of the opinion of the bank employees on specific statements, null hypothesis was formulated. The formulated hypothesis was tested with the help of the ***Kolmogorov Smirvo Test (K.S.Test)*** which has the following form.

D = O-E

Where

D – refers to calculated value

O – refers to cumulative observed proportion and

E – refers to cumulative expected proportion.

6. Results and Discussions

Analysis of Opinion of Employees about E-CRM Services in Banks

The researcher has analyzed the opinion of employees about e-CRM services of banks in Virudhunagar District. The result is presented in the following tables

Types of Banks

In the day-to-day operations of banks, the age old systems were replaced by new and better service. Almost all banks have computerized majority of their branches. After 1970, the system of security oriented lending was replaced by a system, based on purpose and economic importance of the activity financed. Improved systems of credit appraisal, monitoring and supervision were put in place. Banks started offering new deposit schemes to attract the savings of residents as well as non-resident Indians. The introduction of ELECTRONIC BANKING enhanced the

availability of several banking facilities like deposit, loans, overdraft, cheque clearing, transfer of funds and so on based on well laid rules and procedures. Banks are providing various services and facilities to the customers. In Virudhunagar District, there are 22 public sector banks and 8 private sector banks. The researcher has analyzed the responses given by the public sector and private sector banks. The details are shown in the Table 1.

Table 1 Types of Bank

Sl. No.	Types of Bank	No. of Respondents	Percentage to Total
1.	Public Sector Bank	45	54.22
2.	Private Sector bank	38	45.78
	Total	**83**	**100.00**

Source: Primary Data

From the Table 1, it is very clear that 54.22 per cent of the bank branches belong to public sector banks and the remaining 45.78 per cent of the bank branches belong to private sector banks.

Category of the Place of Branch

After 1970, the banks came in for stringent regulations in matters relating to branch expansion and social obligations in lending. As a result, there was a sea change in banking operations. Banks moved from class banking to mass banking whereby banks were no longer the exclusive privilege of affluent people but open to low income and poor people. Banks till their confined to metro cities and urban areas were made to spread into rural and unbanked areas in order to promote the banking habit among the common people. It is necessary to study the place of branch. Therefore the researcher made the study and the results are enlisted in the Table 2.

Table 2. Category of the Place of Branch

Sl. No.	Branches of the Place	No. of Respondents	Percentage to Total
1.	Rural	11	13.25
2.	Urban	42	54.22
3.	Semi urban	27	32.23
	Total	**83**	**100.00**

Source: Primary Data

Table 2 conveys the information that 54.22 per cent of bank branches belong to urban area, 32.23 per cent of bank branches belong to semi-urban area and the remaining 13.25 per cent of bank branches belong to rural areas.

Providing E-CRM Services in the Branch

The concept of adding "e" to CRM and make it as 'e-CRM' seems to get attached to everything in CRM space. The "e" stands for electronic or web-based technology and architecture. The "e" enables an organization to extend its infrastructure to customers and partners in ways that offer new opportunities

I. To reach new customer

II. To do all this in real time,

III. To learn customer needs,

IV. To gain new economics, and

V. To add value,

The researcher confirmed about whether the branch provides e-CRM services or not. The details are shown in the Table 3.

Table 3 Providing E-CRM Services in the Branch

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Providing e-CRM Services	83	100.00
2.	Not Providing e-CRM Services	0	0.00
	Total	**83**	**100.00**

Source: Primary Data

It is inferred from the Table 3 that all the sample bank branches provide e-CRM services to their customers.

Existence of CRM Cell in the Branches

Demonstrating good communication skills and building good relationships means consistently providing response to the customer enquiries. Communication skills are more important in the area of tele-communications, mails and phone calls. Emphatic listing and responding to customers enquiries will provide more satisfaction to customer and so reflect in service standards. Face to face interaction between the customers and the bankers in crucial issues relating to any services will make the customer understand, how the banker cares for his needs. Good communication means instantly answering customer's queries about the status of a particular transaction. That amounts to providing best service. The researcher analyzed whether the branches having CRM cell or not. The details are shown in Table 4.

Table 4. CRM Cell Exists in the Branches

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	CRM Cell Exist	64	77.11
2.	CRM Cell not Exist	19	22.89
	Total	**83**	**100.00**

Source: Primary Data

From Table 4, it is clear that 77.11 per cent of the branches have CRM cell and the remaining 22.89 per cent of the branches do not have CRM cell.

Types of E-CRM Services Provided

E-CRM which is the latest buzzword in the corporate sector is perceived as one of the effective tools in this direction by the banks. Banks leveraging technology can develop innovative customer solutions to attain growth with profitability within the framework of sound risk-management practices. Techno-savvy banks are tapping into online services to initiate a new era in relating management to create one to one relationship as well as one too many relationships to enhance their competitive advantage. Recent developments in critical areas of IT have changed the way banks are managing their customer's relationships. The following are some of the latest e-CRM techniques used by banks in offering new products and services to its customers.

1. Internet banking
2. Data warehousing and data mining
3. Automated teller machine (ATM)
4. Mobile banking
5. National electronic fund transfer (NEFT)
6. Real time gross settlement (RTGS)
7. Society for worldwide inter-bank financial telecommunications (SWIFT)
8. Electronic clearing services (ECS)

The investigator investigates the E-CRM services provided by the bank branches. The leading E-CRM services are internet banking, automated teller machine and mobile banking. Therefore, the researcher asked the bank branches about the availability of these e-CRM services in the bank branches. Table 5 shows the availability of E-CRM services.

Table 5. Types of E-CRM Services Provided

Sl. No.	Types of e-CRM Services	No. of Responses	No. of Respondents	Percentage to Total
1.	Internet banking	83	83	100
2.	Card system	83	83	100
3.	Mobile banking	83	83	100

Source: Primary Data

It is apparent from the Table 5 that all the bank branches provide the leading e-CRM services to their customers.

Most Used E-CRM Services of the Bank

It is necessary to study the types of e-CRM services which are mostly used by the customer. Therefore, the researcher made the study and the list is shown in Table 6.

Table 6. Most used E-CRM Services of the Bank

Sl. No.	Services used by the Customer	No. of Responses	No. of Respondents	Percentage to Total
1.	Internet banking	61	83	73.49
2.	Card system	79	83	83.13
3.	Mobile banking	40	83	48.19

Source: Primary Data

Table 6 reveals that 79 out of 83 bank branches feels that majority of the customers are used card system, followed by internet banking (61 out of 83)and mobile banking (40 out of 83).

Percentage of Customers Using E-CRM Services

It is the main duty of the banker to check the number of customers who use e-CRM services year after year especially whenever new technology is implemented in the branch. So the researcher collected data in that area and the results are enlisted in Table 7.

Table 7. Numbers of Customers are Using E-CRM Services

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Less than 25%	31	37.35
2.	26% to 50%	22	26.51
3.	51% to 75%	25	30.12
4.	More than 75%	5	6.02
	Total	**83**	**100.00**

Source: Primary Data

From the Table 7, it is clear that 30.12 per cent of the bank branches feel that 51% to 75% of customers are using e-CRM services, 26.51 per cent of the bank branches indicate that 26% to 50% of customers are using e-CRM services, 37.35

per cent of the bank branches feel that less than 25% of the customers are using e-CRM services and 6.02 per cent of the bank branches clearly mentioned that more than 75% of the customers are using e-CRM services.

Methods Adopted by the Bank to Attract the New Customer

Motivation is the main tool to make proper utilization of the new service offered especially on banking industry. To check that, the researcher took special attention towards what are methods adopted by the bank to attract the new customer. The findings are listed in Table 8.

Table 8 Methods Adopted by the Bank to Attract the New Customer

Sl. No.	Particulars	No. of Responses	No. of Respondents	Percentage to Total
1.	Advertisement	61	83	73.49
2.	Toll free number	36	83	43.47
3.	Website and Email Id	49	83	59.05
4.	Mobile/SMS	53	83	63.86
5.	Existing Customers	70	83	84.34
6.	Personal Approach	61	83	73.49
7.	Agents	8	83	9.64

Source: Primary Data

It is highlighted from the Table 8 that out of 83 respondents, 70 bank branches attract the new customers by using existing customers, 61 bank branches attract the new customers by the way of advertisement and personal approach, 53 bank branches attract the new customers by using mobile/SMS service, 49 bank branches attract the new customers by following website and E-mail Id, 36 bank branches attract the new customers by using toll free number and 8 bank branches attract the customer by using agents.

Customer Clubs

Formation of customer clubs is another way to promote relationship. These clubs would focus a sense of mutual belonging, understanding and sharing of common problems and emotions. An ideal customer club can act as a bridge between organizations and the customers. Regular meetings can be organized on behalf of the clubs and in those meeting representatives of the organizations can understand the attitude of customers and react accordingly. Customer clubs would act as a forum that enables performance of customer related activities in a smooth manner. The club serves as an effective platform for communicating organizations marketing activities. On behalf of the customer clubs, regular entertainment meets, pleasure trips awareness programs, consumer education programs and so on can be organized involving the family members of the customer. This approach would enhance the level of satisfaction and customers would obviously respond

favourably towards relationship building. The investigator has studied whether the branch has organized customer club or not and its outcome is presented in Table 9.

Table 9. Customer Club in the Branch

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Organizing Customer Club	37	44.58
2.	Not organizing Customer Club	46	55.42
	Total	**83**	**100.00**

Source: Primary Data

Table 9 conveys the information that 55.42 per cent of bank branches do not organize customer clubs and 44.58 per cent of bank branches organize customer club.

Redressal Cell

Every bank has redressal cell in its branches. It should be sensitive to customer's complaints and act immediately on the receipt of complaint. The investigator has studied whether any complaints are received regarding e-CRM services or not and its outcomes is presented in Table 10.

Table 10. Redressal Cell in the Branch

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Complaints Received	82	98.80
2.	No Complaints Received	1	1.20
	Total	**83**	**100.00**

Source: Primary Data

Table 10 indicates that 98.80 per cent of bank branches receive complaint regarding e-CRM services. At the same time 1.20 per cent of bank branch do not receive any complaint regarding e-CRM services.

The Average Number of Complaints Received by the Bank per Month

It is necessary to study the average number of complaints received by the bank branches per month. Therefore the researcher made the study and the result is enlisted in Table 11.

Table 11. The Average Number of Complaints Received by the Bank Per Month

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Less than 10	63	75.90
2.	10 – 20	14	16.87
3.	20 – 30	6	7.23
	Total	**83**	**100.00**

Source: Primary Data

Table 11 shows that 75.90 per cent of bank branches have received the complaints less than 10 per month, 16.87 per cent of bank branches have received the complaints 10 to 20 per month and the remaining 7.23 per cent of bank branches have received the complaints 20 to 30 per month.

Steps taken to redress the complaint received regarding E-CRM Services

The study becomes valid, only if the researcher examines the steps taken to redress the complaints. Table 12 narrates the steps made to redress the complaints. The information collected from the respondents have been analyzed and tabulated and inferences drawn from them are presented here under:

Table 12. Steps Taken to Redress the Complaint Received Regarding E-CRM Services

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Immediately	73	87.95
2.	Within the stipulated time	10	12.05
	Total	**83**	**100.00**

Source: Primary Data

It is apparent from the Table 12 that 73 branches take steps immediately followed by 10 branches that take steps within the stipulated time to redress the complaint regarding e-CRM services.

Nature of Complaint Received on E-CRM Services

The next step is to know the nature of complaints received by the banker. Table 13 shows the details of the nature of complaint made by the customers.

Table 13 Nature of Complaint Received on E-CRM Services

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Internet Banking	26	31.33
2.	Mobile Banking	42	50.60
3.	Electronic Fund Transfer	15	18.07
	Total	**83**	**100.00**

Source: Primary Data

Table 13 brings to light that 50.60 per cent of the bankers say that majority of complaints are received on mobile banking, 31.33 per cent of bank branches received the complaint on internet banking and the remaining 18.07 bank branches received the complaint on electronic fund transfer.

Bank Currently Offer New Services

The survey focused on the current available e-CRM services and the area to assist potential customers by the banks in promoting e-CRM services. The results about the current available e-CRM services provided by the banks are displayed in Table 14.

Table 14. Bank Currently Offer New Services

Sl. No.	Particulars	No. of. Responses	No. of Respondents	Percentage to Total
1.	Online Inquiry and Transfer	73	83	87.95
2.	Online bill – pay	73	83	87.95
3.	Online Mortgage Applications	7	83	8.43
4.	Online small business loan	8	83	9.64
5.	Online Trust Funds	9	83	10.84
6.	Online deposit accounts	60	83	72.29
7.	Online Cheque order	8	83	9.64
8.	Online order of the travelers cheque	16	83	19.28
9.	Online Money order	8	83	9.64
10.	E – Signature	7	83	8.43
11.	Brochures	45	83	54.22
12.	Any other new services	3	83	3.61

Source: Primary Data

It is highlighted from the Table 14 that out of 83 respondents, each 73 bank branches currently offer online inquiry and transfer and online bill-payment, 60 bank branches currently offer online deposit accounts, 45 bank branches currently offer brochures, 16 bank branches currently offer online order of the travellers cheque, 9 bank branches currently offer online trust funds, each 8 bank branches currently offer online small business loan, 8 online cheque order and online money order and each 7 bank branches currently offer online mortgage applications and e-signature.

Available Help or Assistance Provided to E-CRM Banking Customers

A positive sign is that a majority of bank branches currently provide some kind of help to their customers. This assistance includes training, online banking demo, employee assistance, personal service over the telephone and e-mailed instructions. The result is presented in Table 15.

Table 15. Available Help or Assistance Provided to E-CRM Service Banking Customers

Sl. No.	Particulars	No. of. Responses	No. of Respondents	Percentage to Total
1.	Training	16	83	19.28
2.	Online banking demo	25	83	30.13
3.	Employee assistance	53	83	63.86
4.	Personal service over the telephone	52	83	62.65
5.	E – mailed instructions	32	83	38.55

Source: Primary Data

Table 15 reveals that 53 out of 83 bank branches offer employee assistance to their customers, 52 bank branches provide personal service over the telephone to their customers, 32 bank branches offer assistance to their customer through e-mailed instruction, 25 bank branches offer online banking demo to their customers and 16 bank branches offer customer training.

About Transaction Time in E-CRM Services

An E-CRM service is operated through on-line. Therefore, it is essential to know the transaction time for one particular transaction. The researcher made an attempt to study the period of updating on particulars transaction, its results are presented in Table 16.

Table 16. About Transaction Time in E-CRM Services

Sl. No.	Particulars	No. of Respondents	Percentage to Total
1.	Between 5 and 10 minutes	63	75.90
2.	More than 10 minutes	20	24.10
	Total	**83**	**100.00**

Source: Primary Data

It is seen from the Table 16 that 75.90 per cent of the bank branches take 5 to 10 minutes and the remaining 24.10 per cent of the bank branches take more than 10 minutes to update one particular transaction.

Mode of Intimation about E-CRM Services

Customer intimation plays a vital role in utilization of new services offered on any industry. The bank staffs intimate the customers to make use of e-CRM services at their branch by using three different methods. The results are exhibited in Table 17.

Table 17 Mode of Intimation about E-CRM Services

Sl. No.	Particulars	No. of Responses	No. of Respondents	Percentage to Total
1.	Through Advertising Media	65	83	78.31
2.	Appoint specialized staff to explain its features	27	83	32.53
3.	Arranging programs through staff	24	83	28.92
4.	Other	1	83	1.20

Source: Primary Data

From the Table 17, it is clear that 65 out of 83 bank branches feel that explaining the benefits of e-CRM services through advertising media is the best method to intimate their customers to avail of e-CRM services, 28 bank branches feel that better to appoint specialized staff to explain its features and 24 bank branches feel it more useful explain the benefits of e-CRM services through their staff.

Number of Staff Members Trained for E-CRM Services

The study was made to know the number of staff members working with e-CRM services. The findings are listed in Table 18.

Table 18. Number of Staff Members Trained for E-CRM Services

Sl.No.	Particulars	No. of Respondents	Percentage to Total
1.	Less than 3	41	49.40
2.	3 – 6	11	13.25
3.	6 and above	31	37.35
	Total	**83**	**100.00**

Source: Primary Data

It can be found that 41 out of 83 bank branches have less than 3 trained staff in e-CRM services, followed by the 31 bank branches that have 6 and above trained staff in e-CRM services and the rest of 11 bank branches have 3 to 6 trained staff for e-CRM services.

Staff reactions towards implementation of E-CRM Services

Positive response is essential for implementation of services in the banking industry. Hence the researcher tested the staff reactions towards implementation of e-CRM services. The findings are listed in the following Table 19.

Table 19. Staff Reactions towards Implementation of E-CRM Services

Sl. No.	Reaction	No. of Responses	No. of Respondents	Percentage to Total
1.	They play a vital role in implementation of E- CRM services	61	83	73.49
2.	They dedicate them to their work sincerely	23	83	27.71
3.	They provide ideas and suggestions as and when required	31	83	37.35
4.	They find it difficult to work	5	83	6.02

Source: Primary Data

From the Table 19, it is clear that there is a positive staff response towards implementation of e-CRM system, in 61 bank branches, the staff play a vital role in implementation of e-CRM services and provide ideas and suggestions as and when required in 31 bank branches and they dedicate themselves to their work sincerely 23 in out of 83 and other find it difficult to work 5 out of 83 bank branches.

Purpose for Frequently Availing of E-CRM Services by Customers

Necessity is the mother of invention. To support this fact, there must be a special purpose to avail of the e-CRM services. So the researcher was eager to know the special purpose for frequently availing of e-CRM services by the customers. The findings are listed in Table 20.

Table 20. Purpose for Frequently Availing E-CRM Services by Customers

Sl. No.	Particulars	No. of Responses	No. of Respondents	Percentage to Total
1.	Mobile banking services	38	83	45.78
2.	Internet banking services	67	83	80.72
3.	ATM services	70	83	84.34

Source: Primary Data

It is obvious from the Table 20 that the frequently availing of e-CRM services by customers are ATM services (70 out of 83 bank branches), followed by internet banking services (67 out of 83 bank branches) and mobile banking (38 out of 83 banks branches).

Customer's Reaction towards E-CRM Services (From the View of Banker)

Success of e-CRM services depends on the part of proper customer's utilization. The researcher has an idea to know the customers' reaction to operate their accounts under e-CRM services. The information collected from the bank officials has been analyzed and tabulated. The inference drawn from them is presented in Table 21.

Table 21. Customers' Reaction towards e-CRM Services (from the View of Bankers)

Sl. No.	Customers' Reaction	No. of Responses	No. of Respondents	Percentage to Total
1.	Bank staff trained the customers well in advance	29	83	34.94
2.	They require assistance while operating accounts	22	83	26.51
3.	They follow operational procedures easily	59	83	71.08

Source: Primary Data

It is clearly stated from the Table 21 that 59 out of 83 bank branches feel that the customers follow operational procedures easily, followed by the bank staff who trained the customers well in advance (29 out of 83) and those who require assistance while operating accounts (22 out of 83 bank branches).

Methods used to Motivate Customers to Make Use of E-CRM Services

Motivation is the main tool to make proper utilization of the new services offered especially in banking industry. To check that, the researcher examined the methods used to motivate the customers to make use of e-CRM services. The findings are listed in Table 22.

Table 22. Methods Used to Motivate Customers to Make Use of E-CRM Services

Sl. No.	Methods	No. of Responses	No. of Respondents	Percentage to Total
1.	Explaining Benefits	63	83	75.90
2.	Organizing various programmes	6	83	7.23
3.	Advertising through media	52	83	62.65
4.	Any other	2	83	2.41

Source: Primary Data

From the Table 22, it is clear that 63 out of 83 bank branches feel that explaining benefits of e-CRM services is the effective method of motivation.

Performance of Branch after implementation of E-CRM Services

Performance evaluation in every stage of banking activities takes the bank one step ahead from other competitor bank. Hence, the researcher tried to know the performance of branch after implementation of e-CRM services. The information collected from the respondents has been analyzed and tabulated and inferences drawn from them are presented in Table 23.

Table 23. Performance Evaluation of Branch after Implementation of E-CRM Services

Sl. No.	Implementation of e-CRM Services	No. of Responses	No. of Respondents	Percentage to Total
1.	Increase in goodwill	18	83	21.69
2.	Popular among customers	25	83	30.12
3.	Better services	63	83	75.90
4.	Better customer satisfaction	46	83	55.42

Source: Primary Data

It is apparent from the Table 23 that 63 out of 83 bank branches can provide better service after implementation of e-CRM services, followed by better customer satisfaction (46 out of 83 bank branches). They are also popular among customers only after implementation of e-CRM services (25 out of 83 bank branches).

Profitability of Bank after implementation of E-CRM Services

It is the main duty of the banker to check the profitability ratio year after year especially whenever a new technology is implemented in the bank. So the researcher collected data in that area and the result is enlisted in Table 24.

Table 24 Profitability of Bank after Implementation of E-CRM Services

Sl. No.	Opinion	No. of Respondents	Percentage to Total
1.	High	36	43.57
2.	Medium	26	31.33
3.	Reasonable	21	25.30
	Total	**83**	**100.00**

Source: Primary Data

Table 24 conveys the information that 43.57 per cent of the bank branches clearly mentioned that the bank could increase their profitability ratio after implementation of e-CRM services. It high level, 31.33 per cent of the bank branches indicate that the profitability ratio is medium and 25.30 per cent of the bank branches feel that their profitability ratio is reasonable after the implementation of e-CRM services.

Overall Opinion of Bank Officials about E-CRM Services

The drivers aiding the growth of the bank industry are called opinion. The following opinions are aiding the growth of the bank industry in Virudhunagar District. These opinions are presented in Table 25.

Table 25. Overall Opinion of Bank Official about e-CRM Services

Sl. No.	Opinion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1.	Benefits outweigh the cost	36	39	8	--	--
2.	Allows banks to increase customer base	48	35	--	--	--
3.	Improve customer services	49	34	--	--	--
4.	Lowers transaction costs	38	43	1	1	--
5.	Offers opportunities to provide additional services	50	21	12	--	--
6.	Maintenance cost of Accounts is economical	27	48	6	2	--
7.	More customer training/ customer education is needed for promoting e–CRM banking sectors	36	33	5	9	--
8.	e–CRM services enhance your competitive position in the market	44	38	1	--	--
9.	Your e–CRM services increased with the degree of customer satisfaction	46	37	--	--	--
10.	Your bank believes that the customer's personal information security is better now than it was before	27	50	5	1	--
11.	Essential for Bank's survival	37	41	5	--	--
12.	Gives the impression of cutting edge Bank	36	45	1	1	--
13.	Important to complete effectively in the near future	42	38	2	1	--
14.	Banks not offering e–CRM banking services will lose their potential customers	33	41	9	--	--
15.	Improve bank's efficiency so that banks can offer better services	35	47	1	--	--

16.	Your bank has established e-CRM banking services into your bank's future strategic planning	41	40	2	--	--

Source: Primary Data

Table 25 exhibits the opinion of banking business in Virudhunagar District. Bank officials tell their opinion about 16 statements of banking business in Virudhunagar District like offers opportunities to provide additional services, improve customer services, allows banks to increase customer base, e-CRM services increases the degree of customer satisfaction and so on.

Competition plays an important role in banking business. In banking business there should be stiff competition. To overcome the competition, the bank officials can satisfy the needs and wants of the customers.

Opinion of the Bank Officials about E-CRM Service – Reliability Test

In order to test the reliability for opinion of bank officials about e-CRM banking services, Cronbach's Alpha Test has been applied and the results have been shown in Table 26.

Table 26. Reliability Statistics for Opinion of the Bank Officials about e-CRM Banking Services

Particulars	Cronbach's Alpha Score
Opinion of the Bank Officials about e-CRM Banking Services	0.911

Source: Primary Data

Table 26 shows that the calculated value of Cronbach's Alpha for the opinion of bank officials about e-CRM banking services is more than 0.7. Hence, it is concluded that the opinion of bank officials about e-CRM banking services could be relied upon.

Opinion of the Bank Officials about E-CRM Service – Application of Kolmogorow Smirnov Test (K.S.Test)

In order to study the opinion of the bank employees about the various statements regarding e-CRM services, the K.S. Test has been used. For the purpose of this study, the following null hypothesis is framed.

"There is no significance difference in the opinion of the bank employees about the statements regard with e-CRM services".

In K.S. test, the cumulative observed proportion is calculated on the basis of observed number. In each case, the observed proportions are calculated by dividing

the respondents. For all graduations, the same method of calculation is followed. On the basis of observed proportion cumulative proportion is calculated on the basis of expected proportion. Since there are five gradations each gradation (i.e. 20) is assigned as expected proportion on the basis of proportion and the cumulative expected proportion is calculated.

For each gradation, the difference between cumulative observed proportion and cumulative expected proportion is calculated. The largest difference will be taken as calculated value.

The table value at both 95 per cent and 99 per cent confidence level is $\frac{1.36}{\sqrt{n}}$, that is $\frac{1.36}{\sqrt{83}}$ = 0.15. If the calculated value is greater than the table value, the null hypothesis is rejected otherwise accepted.

The result of K.S. Test is given in Table 27.

Table 27. Result of K.S. Test on the Opinion of Bank Officials about E-CRM Services

Sl. No.	Statement	Calculated Value of K.S. Test	Table Value of K.S. Test	Results
1.	Benefits outweigh the cost	0.10	0.15	S.
2.	Allows banks to increase customer base	0.20	0.15	N.S
3.	Improve customer services	0.21	0.15	N.S
4.	Lowers transaction costs	0.12	0.15	S
5.	Offers opportunities to provide additional services	0.22	0.15	N.S
6.	Maintenance cost of Accounts is economical	0.03	0.15	S.
7.	More customer training/ customer education is needed for promoting E – CRM banking sectors	0.10	0.15	S.
8.	E – CRM services enhance your competitive position in the market	0.17	0.15	N.S
9.	Your E – CRM services increased with the degree of customer satisfaction	0.18	0.15	N.S.
10.	Your bank believes that the customer's personal information security is better now than it was before	0.03	0.15	S
11.	Essential for Bank's survival	0.11	0.15	S.
12.	Gives the impression of cutting edge bank	0.10	0.15	S
13.	Important to complete effectively in the near future	0.16	0.15	N.S

14.	Banks not offering E – CRM banking services will lose their potential customers	0.08	0.15	S
15.	Improve bank's efficiency so that banks can offer better services	0.09	0.15	S
16.	Your bank has established E- CRM banking services into your bank's future strategic planning	0.14	0.15	S

S. – Significant, N.S. – Not Significant

The result of K.S. test gives clear idea about the opinion of bank employees about the e-CRM services in Virudhunagar District. According to K.S. Test, the bank employees have different opinion about the individual statement of e-CRM services of banking sector.

With regard to the statements number 1, 4, 6, 7, 10, 11, 12, 14, 15 and 16, the bank employees have the same opinion and regard to statements number 2, 3, 5, 8, 9 and 13 there is a difference in the opinion of bank employees about the e-CRM services.

7. Summary of Findings, Suggestions and Conclusion

Summary of Findings

Majority of the public sector bank branches are giving more response, bank branches which are belonging to urban areas, all the sample bank branches provide e-CRM services to their customers, bank branches have CRM cell, 83 bank branches provide card services to their customers, Customers use card system under e-CRM services, Customers are using e-CRM services and bank branches attract the new customers by using existing customers.

The researcher finds that Majority of the bank branches do not organize customer clubs, Vast majority of the bank branches have received complaints regarding e-CRM services, 63 bank branches have received complaints less than 10 per month, bank branches take steps immediately to redress the complaint received regarding e-CRM services, most of the complaints were received on mobile banking and vast majority of the bank branches currently offer online inquiry and transfer and online bill payments.

It is found that majority of the bank branches offer employee assistance to their customer, bank branches take 5 or 10 minutes to update one particular transaction under e-CRM services, bank branches intimate their customers through advertising media to avail of e-CRM services, bank branches have only less than 3 staff who take special training for the e-CRM services, bank branches feel that the staff play a vital role in implementation of e-CRM services and Majority of the bank branches said that the customers frequently availed of ATM services.

It is clear from the study that the majority of bank branches feel that the customers follow operational procedures easily while operating their accounts under e-CRM services, bank branches feel that explaining benefits of e-CRM services is the effective method of motivation, The bank branches can do better services after implementation of e-CRM services and Most of the bank branches mentioned that the bank could increase their profitability ratio especially after implementation of e-CRM services at high level.

According to K.S. Test, the bank employees have different opinion about the individual statement of e-CRM services of banking sector with regard to the statements number 1, 4, 6, 7, 10, 11, 12, 14, 15 and 16, the bank employees have the same opinion and regard to statements number 2, 3, 5, 8, 9 and 13. There is a difference between the opinions of bank employees about the e-CRM services.

Suggestions

The following suggestions are offered for improving electronic customer relationship management services of banks.

It is found from the study that in order to increase the usage of internet banking services, the banks may reduce the service charge.

As majority of the respondents have been encouraged to voice out their grievances to the Bank as and when they feel that they are not satisfied with the system.

It is found that customers of the bank use the ATM card only for the purpose of cash withdrawal. It is also suggested that the bank shall encourage the customers to use ATM card for different purposes like payment of electricity bills, telephone bills, payment of insurance premium and payment for railway and air tickets through the ATM card.

It is found from the study that the customers expect the service of fund transfer through ATM card. Therefore, the researcher suggested that the banks should take steps to provide such service.

As majority of the respondents feel that the internet banking services are not secure, the banks should make the people aware about the security system in internet banking.

As majority of the respondents are uncomfortable in using mobile devices for banking purposes, the banks should form a separate department in the bank itself to take care of the mobile banking services.

The banks have been brought into notice the insufficient number of staff posted in different branches and have been requested to take adequate steps to post the requisite strength of staff to meet the services of the customers.

The bank authorities have been asked to conduct an awareness camp to customers about the other services available to them apart from ATM services.

All banks should take steps to form customer club to maintain better relationship with customers.

Conclusion

To-day bank officials must distinguish themselves by meeting the needs of their customers better than those of their competitors. Bank Officials should prepare service plans that include decision on target customers, product and services and service atmosphere. There is a general agreement that a basic banking strategy for creating competitive advantage is the delivery of high service quality. Therefore, by giving better service and product, definitely the banks can taste the success.

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Cultural Heritage Tourism in South Africa: Perceived a Panacea for Rural Development?

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Abstract: Cultural heritage tourism is perceived as one of the major development opportunities for Africa**.** This study conducted in South Africa, enquired the perceptions of the local communities towards their cultural heritage tourism development, and their level of participation in such development. Quantitative data were collected from simple randomly selected respondents using a structured questionnaire. Descriptive data analysis provided information required to address research objective. Local community members surveyed are sceptic towards cultural heritage tourism development invariably becoming a panacea for their rural development. Cultural heritage tourism development in South Africa should align with the sustainable rural tourism critical success factors recommended by this paper. This study conducted in a district of South Africa has implications for cultural heritage tourism development in developing economies.

Keywords: cultural tourism; heritage tourism; rural development; local perceptions; sub-Saharan Africa

JEL Classification: O55; R11; Z32

1. Introduction

Recent research in cultural heritage tourism development in sub-Saharan Africa and beyond have stressed on the importance of cultural heritage tourism development as one of the portfolios of sustainable development, highlighting the challenges such development may pose within local communities (such as Boswell & O'Kane, 2011; Gupta & Dada, 2014; Hüncke & Koot, 2012; Ivanovic & Saayman, 2013a; Ivanovic and Saayman, 2013b; Jugmohan, Spencer & Steyn,

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2016; Loulanski & Loulanski, 2011; Saarinen & Rogerson, 2015; Spencer & Jessa, 2014; Titus & Spencer, 2015; Van der Merwe & Rogerson, 2013). Much of these studies assumed that local communities will embrace such development as a tool to spur on their socio-economic development. This study will therefore enquire the perceptions of the local communities towards cultural heritage tourism development, and their level of participation in such development. Local perceptions towards this development may be positive, sceptic or negative, suggesting inferences that can be drawn about this development, based on literature.

Diverse forms of tourism are promoted in destinations, however incorporating local products and cultural attributes into tourism are desirable (Liu, 2006). Cultural tourism denoting the type of tourism that attracts tourists to visit a destination to experience local culture has an acclaimed potential to benefit local communities and to motivate them to maintain their cultural heritage (Ezeuduji & Rid, 2011, p. 189). Local communities' participation and cooperation with other tourism stakeholders are however said to be critical for successful cultural tourism development (Sdrali & Chazapi, 2007). Jugmohan, Spencer and Steyn (2016) posit heritage as a broad concept that includes the natural and the cultural environment. It includes landscapes, historic places, sites and built environments, biodiversity, collections, cultural practices, knowledge and living experiences.

Tourism does not always bring benefits expected by the local communities. Motivation to be involved in tourism and other factors that support locals' active involvement are critical to successfully integrate local communities into their tourism development (Ezeuduji & Rid, 2011). The study by Akama and Kieti (2007, pp. 746 – 747) highlighted some of the ways in which tourism can significantly contribute to the much popularised sustainable rural development in developing countries to include: (1) creation of clear opportunities for local and self-employment; (2) supporting collaboration amongst local actors, namely private and public sectors, not for profit organisations, and local population; (3) improving socio-cultural impacts of tourism; (4) allowing local access to services and infrastructure being provided for tourists; (5) enabling local population participation; and (6) fostering continuous institutional capacity-building to support locals' active participation. Ezeuduji and Rid (2011, p. 190) referred to Akama and Kieti's (2007) first, third and fourth critical success factors as "desired outcomes", and the second, fifth and sixth factors as the "enablers" to achieve "the desired outcomes". It is expected that when these aforementioned factors are in place, local communities will perceive tourism development positively and be motivated to participate in this development, with positive "attitude".

2. Literature Review

Saarinen and Rogerson (2015) posit that cultural tourism is perceived as one of the major development opportunities for Africa. Boswell and O'Kane (2011) communicated the significance of heritage in constructing African states' identity and as a source of knowledge in Africa and highlighted the complexities of heritage management on the continent. Ivanovic and Saayman (2013a) claimed that cultural tourism is the most popular type of tourism in the world based on the universality of cultural motivation and consumption. They (Ivanovic and Saayman) further suggested that the African destination's unique cultural tourism products must be packaged and promoted. Loulanski and Loulanski (2011) explored the relationship between tourism and cultural heritage. Their results revealed a representative set of synthesis factors aimed at achieving sustainability. These include among others, sustainability-centered tourism management and practice, local involvement, integrated planning and management, site management, integrated governance and stakeholder participation or destination management. Gupta and Dada (2014) communicated cultural tourism's position as an agent of sustainable development, illustrated in the core values of public education, respect for diversity, authenticity of programmes or projects, and preservation of heritage. They (Gupta & Dada) observed that cultures are mobilised for tourists and read by tourists within particular settings and focused on the learning and transmission of meanings using symbols and objects. Titus & Spencer (2015) who connected cultural tourism to slow tourism in their research referred slow tourism as the practice of quality time spent by visitors, mostly in areas with natural resources such as protected parks, heritage sites, and gardens. They asserted that engaging in slow tourism activities do allow visitors to experience the destination at a much deeper level.

Cultural tourism is highlighted as one of the fastest expanding sectors of the global tourism economy with some researchers estimating that as much as 40% of international leisure tourism involves a cultural component (Novelli 2015). Within sub-Saharan Africa, cultural tourism is identified by Christie, Fernandes, Messerli, and Twining-Ward (2013) and Novelli (2015) as providing untapped potential for providing opportunities for tourism expansion and inclusive growth. According to a World Bank report, rich traditions of music, art and dance in sub-Saharan Africa form unique cultural tourism believed to provide substantial opportunity for tourism growth (Christie et al., 2013). Many African countries (including Botswana, Kenya, Tanzania, Mozambique, Ghana, and Mali) have used cultural tourism niche product to diversify their tourism economies (Rogerson 2012). Currently in Africa, cultural World Heritage Sites are being continually developed as "key anchor projects" for tourism destinations (Rivett-Carnac, 2011, p. 6). These include South Africa's Cradle of Humankind and Mapungubwe National Park, Kilwa Kiswani in Tanzania, and Great Zimbabwe in Zimbabwe. However, cultural

heritage products are posited by Twining-Ward (2009) as some of the most underdeveloped Africa's tourism products.

Recent focus on experience economy and the unique experiential value proposition of cultural heritage products is becoming a pivot of cultural tourism development for emerging destinations, including South Africa (Ivanovic & Saayman, 2013b). Hüncke and Koot (2012) posit that cultural tourists have a dual nature – tourists searching for authentic cultures (reflected in the expectations of a pristine and exotic lifestyle), and their accompanied search for local communities and their process of development. Spencer and Jessa (2014) called for the development of a creative tourism strategy, forming part of a wider cultural heritage tourism plan in South Africa, to be implemented for cultural regeneration. They (Spencer & Jessa) argued that this will provide an avenue for economic and skills development and raise the overall creative profile of the destination. Local communities can develop their natural and cultural assets for tourism activities to their own benefit. Jugmohan et al. (2016) posit that rural communities can benefit from tourism skills development and be involved in tourist guiding, arts and crafts' production, selling local dishes, and at the same time organising, using and maintaining the natural and cultural resources. Local communities should control their own facilities, and guard against the illegal exploitation of their physical, natural and cultural resources. Van der Merwe and Rogerson (2013) however pointed to the challenges faced by local communities in under-performing heritage tourism destinations to include local tourism marketing, poor budgeting, lack of leadership and strategic direction for tourism development.

3. Research Method and Design

This research was conducted in the Zululand District Municipality in KwaZulu-Natal Province, South Africa. Zululand District Municipality has many cultural heritage sites that are developed for tourism. This district has five local municipalities namely Ulundi, Nongoma, Abaqulusi, uPhongolo, and eDumbe. This study was specifically done in the rural areas of Ulundi, Nongoma, and Abaqulusi. As this study is mostly exploratory, requiring much quantified responses from the respondents and involving more descriptive than explanatory analysis, questionnaire survey is therefore the best method to garner such information (Veal, 2011). A survey of local communities in these local municipalities used simple random sampling technique to select respondents. A structured questionnaire was used to gather data, where questionnaires were either respondent-completed or researcher-completed. Respondent-completion was required from local population who have adequate level of Western education to support questionnaire completion in English Language, and researcher-completion was done with local population with no adequate Western education. For the latter case, the content of the questionnaire and the respective responses were

communicated using the local language, as the questionnaire was translated. 160 questionnaires were administered and returned, but 143 were usable for analysis. Descriptive analysis of the questionnaire variables was done using IBM's SPSS software (IBM Corporation, 2013). Variables in the questionnaire emanate from previous studies (such as Ezeuduji & Rid, 2011; Ivanovic & Saayman, 2013a; Ivanovic and Saayman, 2013b; Jugmohan et al., 2016; Loulanski & Loulanski, 2011; Saarinen & Rogerson, 2015; Spencer & Jessa, 2014; Van der Merwe & Rogerson, 2013).

4. Results and Discussion

Results from Table 1 indicate that local communities generally perceive that cultural heritage tourism products should be conserved, however a significant number (more than one-third) of these local communities' members do not participate at all in cultural heritage tourism activities.

Table 1. Participation and general perception towards cultural heritage tourism (N=143)

Variable	Category	Frequency (%)
Participation level of the local community in cultural heritage tourism activities	Not at all Once Twice Continuously	**35** 21 21 23
Perception towards conserving cultural heritage tourism products	Yes No Not sure	**90** 4 6

It is previously stated in the introductory part of this paper that tourism does not always bring benefits expected by the local communities. Motivation to participate in tourism and other factors that support locals' active involvement are critical to successfully integrate local communities into their tourism development (Ezeuduji & Rid, 2011).

Variables in Table 2 explored the reactions of local communities' members towards some specific cultural heritage tourism development outcomes. In as much as the majority of the local community members perceive these cultural heritage tourism outcomes as positive (especially offering wide range of opportunities, attracting tourists' visitation, and enabling sustainability of cultural heritage sites), however the significant number of the respondents who are sceptical towards the cultural heritage tourism development and how it affects them should be addressed. A significant number of the respondent (one-third or more) are not sure that cultural heritage tourism development raises individuals' cultural awareness; enables income generation; supports infrastructure development; and uplifts living

standards in the communities. It follows therefore that these sceptic responses to the cultural heritage tourism development may be the reason why local community members are reluctant to participate in the cultural heritage tourism activities. Research by Akama and Kieti (2007, pp. 746 – 747) communicated some of the ways in which tourism can significantly contribute to sustainable rural development in developing countries to include: creation of clear opportunities for local and self-employment; supporting collaboration amongst local actors, namely private and public sectors, not for profit organisations, and local population; improving socio-cultural impacts of tourism; allowing local access to services and infrastructure being provided for tourists; enabling local population participation; and fostering continuous institutional capacity-building to support locals' active participation.

Table 2. Specific perceptions towards cultural heritage tourism development outcomes (N=143)

Brand essence	**Strongly agree or agree (%)**	**Neither agree nor disagree (%)**	**Disagree or strongly disagree (%)**
Cultural Heritage Tourism (CHT) creates a wide range of opportunities	**81**	16	3
CHT raises individual cultural awareness	64	**32**	4
CHT enables income generation	64	**30**	6
CHT supports infrastructure development	60	**32**	8
CHT enables restoration of historical sites	61	27	12
CHT attracts tourists visitation	**77**	18	5
CHT enables usable skills development e.g. Business skills	69	26	5
CHT supports upliftment of living standards	58	**33**	9
CHT enables sustainability of cultural heritage sites	**71**	22	7

As Jugmohan et al. (2016) communicated, rural communities can benefit from tourism skills development and be involved in tourism activities in different areas such as tourist guiding, arts and crafts' production, selling local dishes, and at the same time organising, using and maintaining the natural and cultural resources. As Ezeuduji (2015) pointed out, not-for-profit organisations as rural tourism stakeholders who demand local empowerment and equity in local communities can be tasked by local municipalities to facilitate capability building of the local community members for rural tourism services.

5. Conclusion and Recommendations

This study found that local communities generally perceive that cultural heritage tourism products should be conserved, however a significant number do not participate at all in cultural heritage tourism activities. Majority of the local community members perceive cultural heritage tourism development outcome as positive, however a significant number of them are sceptical towards the cultural heritage tourism development and how it affects them. A significant number of the respondents are not sure that cultural heritage tourism development does raise individuals' cultural awareness; enable income generation; support infrastructure development; and uplift living standards in the communities. It can be induced therefore that these sceptic responses to the cultural heritage tourism development may be the reason why local community members are reluctant to participate in the cultural heritage tourism activities. It is therefore recommended that these local municipalities tread with care in the development of their cultural heritage tourism. Supporting collaboration amongst local actors, creating opportunities for local employment, allowing local access to services and infrastructure used by the tourists, supporting local participation and enabling institutional capacity-building that supports active local participation, are ways to foster inclusive cultural heritage tourism development.

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International Economics

European Union of the Regional Disparities

Romeo-Victor Ionescu[1]

Abstract: The paper deals to the idea of the necessity of changing EU's political approach in order to face to the new inside and global challenges. In order to support this idea, the analysis uses four representative indicators: educational attainment level, hospital beds at 100000 inhabitants, employment rate and unemployment rate. The initial analysis was focused on EU's regions and pointed out great disparities. A distinct part of the analysis covers Romanian regions. The analysis is realized on two levels: macroregions and NUTS 2 regions. Romania is not an exception from the paper's approach. The main conclusion of the analysis is that EU arrived into critical point and has to change its political and economic approach in order to reduce and to eliminate the regional disparities and to increase its credibility as global actor.

Keywords: regional disparities; strategic regions; regional cohesion; regional policy.

JEL Classification: R11; R12; R50

1. Introduction

The Regional Policy represents the essential component of the Cohesion Policy. During the present financial perspective, it covers 1/3 from the EU budget and becomes the EU28's main investment policy.

Even that the Regional Policy is financed from three sources, the ERDF covers the greatest amount. ERDF is focused on financing: R&D and innovation; digital agenda; SMEs; and low-carbon economy.

On the other hand, the Regional Policy supports the achieving of the Europe 2020 Strategy's targets.

The European Commission has an optimistic point of view regarding the implementation of this policy (European Commission, 2016). Unfortunately, the latest developments (Grexit, Brexit) didn't support this approach.

The same Regional Policy implemented specific regulations related to different strategic regions as the Arctic region (European Parliament and the Council, 2012).

Other regulation was focused on IPA II instrument, which offers financial and

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technical support to the candidate and potential candidate countries (European Parliament and of the Council, 2014).

The European Commission adopted four macro-regional strategies for the Baltic Sea region the Danube region, the Adriatic and Ionian region and the Alpine region (European Commission, 2015).

In order to solve the Grexit crisis, the European Parliament and the Council adopted a regulation able to support and to encourage Greece's economic recovery (European Parliament and the Council, 2015).

2. Literature Review

Regional disparities represent a theme which was, is and will be analysed by many researchers.

The connection between the regional economic structures and the existing disparities is presented under a very interesting approach in relation to the productive mix and the labour market structure. The regional clusters across the EU are analysed using a multivariate analysis method (STATIS). The authors concluded that the regional disparities increase between the Mediterranean regions, central-northern Europe and central-southern England. The main element which supports these disparities is the labour market flexibility. Moreover, localization factors and the industrial base accompanied by high levels of income and employment lead to the same disparities (Amendola, Caroleo & Coppola, 2004).

The regional disparities related to GDP per capita. Using an improved variant of Lucas model, the authors built a bell-shaped curve in order to describe the relationship between the level of regional inequalities and the per capita national income level. The analysis covers 17 Member States. The main conclusion of the analysis is that regional inequalities inevitably rise as economic development proceeds but then tend to decline once a certain level of national economic development is reached (Barrios & Strobl, 2005).

This is why the dedicated literature was put into discussion in order to observe if it was able to detect convergence or divergence trends across countries or regions. An interesting scientific approach was focused on eight Member States and concluded that both short-term divergence and long-term convergence processes coexist. Moreover, the authors proposed a theoretical and empirical model which allows for short to medium term processes related to economic cycles and long-term processes related to diverse levels of GDP per capita to have an independent impact on regional inequality (Petrakos, Rodríguez-Pose & Rovolis, 2005).

An interesting approach is that considering that the EU regional disparities are effects of the labor markets dysfunctions. The composition and structure of labor

markets seem to be main elements able to support regional disparities in Europe. As a result, the labor markets flexibility and the unemployment are both essential in increase the regional disparities. The analysis in this paper doesn't eliminate other factors of the regional disparities, as localization factors and the presence of a solid industrial base accompanied by high levels of income and employment (Amendola, Caroleo & Coppola, 2006).

A more optimistic approach results from the analysis of the regional convergence across the EU. This paper deals to the Convergence Policy as a support for Beta-convergence. Beta-convergence represents the process which allows the poor regions to grow faster than the rich regions and therefore to catch up on them. A distinct part of the paper is dedicated to Sigma-convergence, which represents the possibility to decrease the regional disparities. Even that the economic growth equations used in the analysis led to pertinent conclusions, the author suggested the need of a microeconomic approach as well (Monfort, 2008).

The intra and inter-regional disparities in Romania were analysed using multiple statistical techniques as Gini index, Herfindahl index and Theil index, as well. The analysis is focused on NUTS2 and NUTS3 regions. The main conclusions of the analysis are the low regional economic concentration and the relatively low amplitude of both inter-regional and intra-regional disparities (Goschin, Constantin, Roman & Ileanu, 2008).

Other approach is focused on the connection between regional disparities, convergence and increasing spatial concentration. The analysis covers only EU15 and points out the increasing of the convergence of regional per-capita income in these countries. On the other hand, the income disparities decreasing at national level are not necessary followed by the same trend across the regions within the EU countries. Moreover, the economic agglomerations tend to increase disparities within the EU member states (Geppert & Stephan, 2008).

One of the latest scientific approaches is based on a multilevel analysis in selected OECD countries in order to point out the regional disparities. This research covers 86 regions in five Member States: Czech Republic, France, Italy, Spain and UK. The analysis was focused on the access to health care using representative indicators.

At least two important conclusions come from this analysis. First, is connected to dissatisfaction with the health system. It becomes more important than the lack of accessibility. The second conclusion points out the impact of the cost, distance and lack of time on health care (Brezzi & Luongo, 2016).

3. Regional Disparities Across EU's Regions

Nowadays, EU faces to more regional disparities than regional cohesion elements. Some representative socio-economic indicators lead to the same conclusion.

The population aged 30-34 by educational attainment level, for example, represented 17.2% from total population in EU28 and 19.5% in the Euro area in 2015 (Eurostat, 2016). The gap related to this indicator is huge (17.78: 1) (see Figure 1).

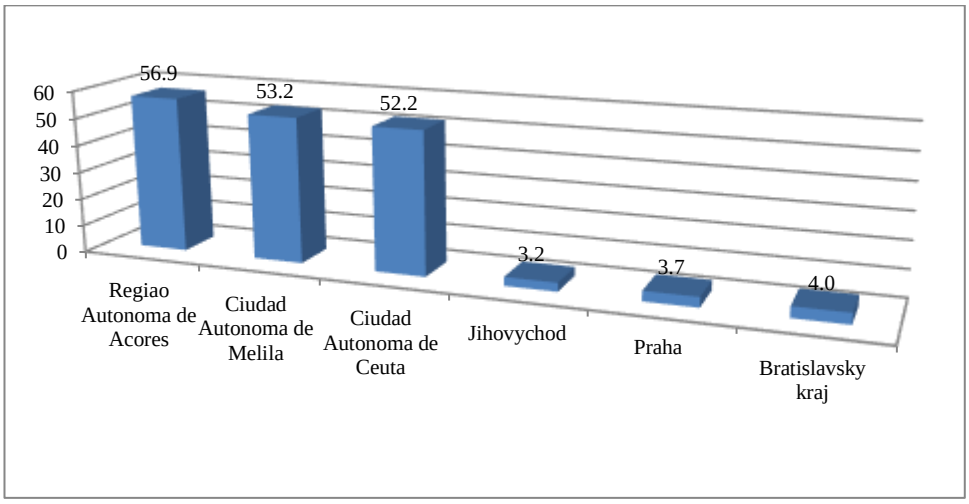

Figure 1. Educational attainment level

Source: Personal contribution

The medical care system faces to high regional disparities, as well. Under the number of hospital beds at 100000 inhabitants, the regional disparities are presented in Figure 2 (Eurostat, 12.07.2016; Eurostat, 05.08.2016).

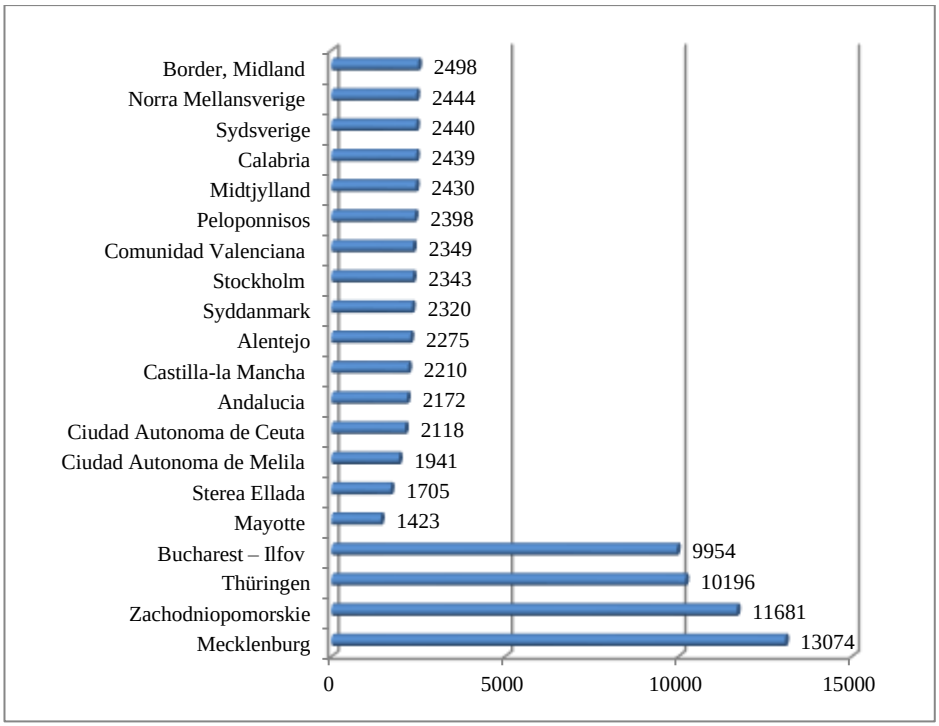

Figure 2. Number of hospital beds/100000 inhabitants (selected regions)

Source: Personal contribution

EU's regions present huge disparities related to the labour market. The employment rate, for example, faces to a gap of 2.09: 1 (Eurostat, 19.07.2016) (see Figure 3).

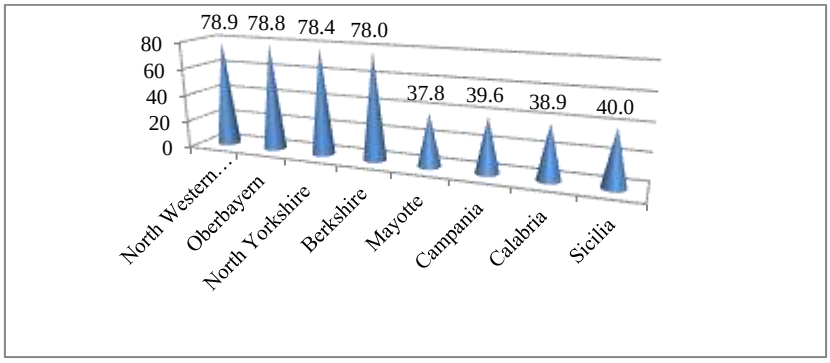

Figure 3. Regional disparities related to employment rate (%)

Source: Personal contribution

Moreover, the unemployment rate leads to the same great disparities. The main regional unemployment disparities are presented in Figure 4 (Eurostat, 19.07.2016). The gap between the peak and the bottom values for this indicator is 13.6: 1.

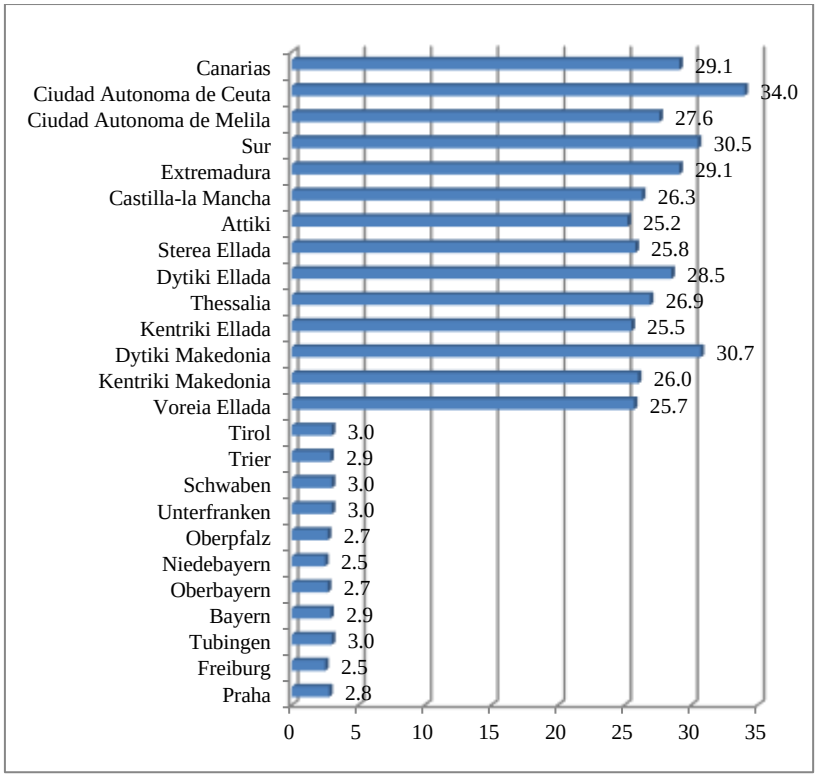

Figure 4. Regional disparities related to unemployment rate (%)

Source: Personal contribution

4. Regional Disparities in Romania

During the present financial perspective, the ERDF's allocations for Romania cover 15058.8 million euros for less developed regions and 441.3 million euros for more developed regions. This can be understood as the existence of high regional disparities. One of these is related to the population aged 30-34 by educational attainment level. Its trend across the macroregions is presented in Figure 5.

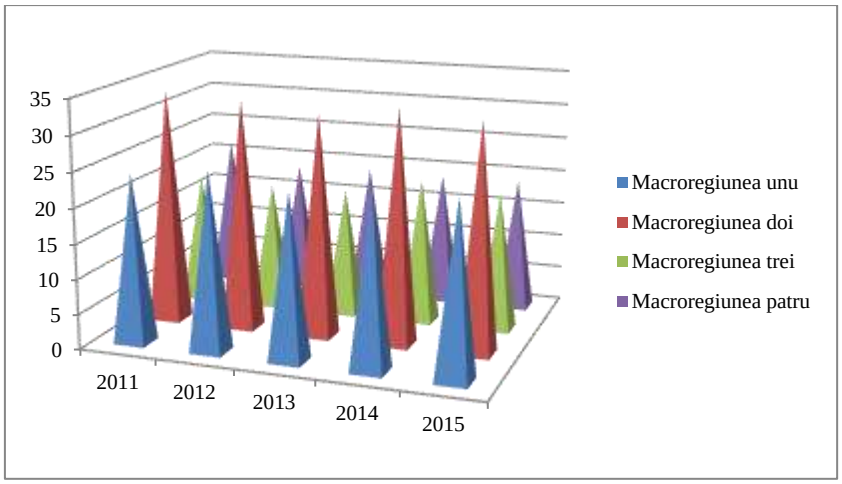

Figure 5. Access to education in Romania (%)

Source: Personal contribution

The disparities increase across NUTS 2 region level, where the gap is 2.7:1 (see Figure 6).

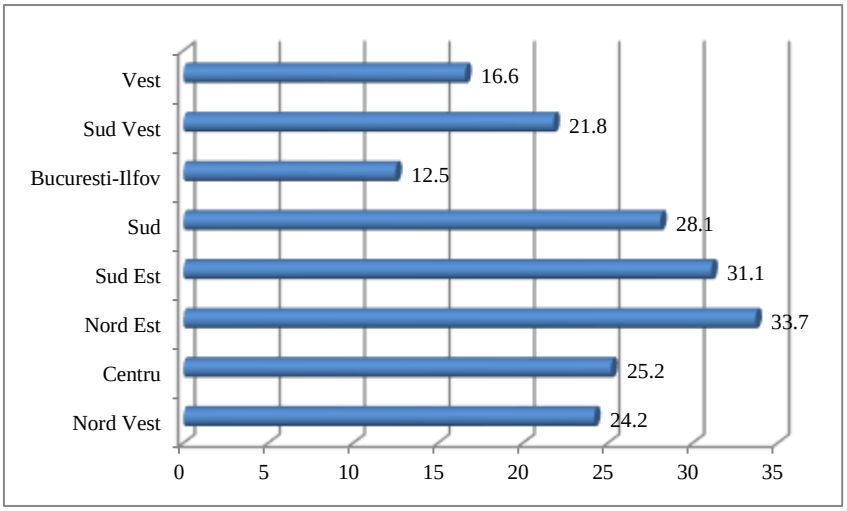

Figure 6. Regional accesses to education in Romania (%)

Source: Personal contribution

Region Bucuresti-Ilfov has the greatest number of hospital beds compared to the other 7 NUTS 2 regions. The gap between this region and region Sud is 2.03:1 (see Figure 7).

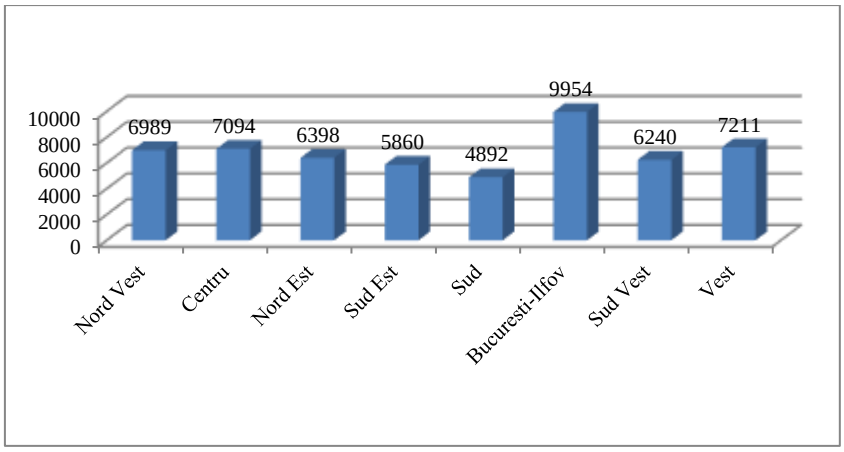

Figure 7. Number of hospital beds on regions in 2015 (number/100000 persons)

Source: Personal contribution

The employment rate leads to the high regional disparities, as well. These disparities seem to be greater between macroregions (see Figure 8).

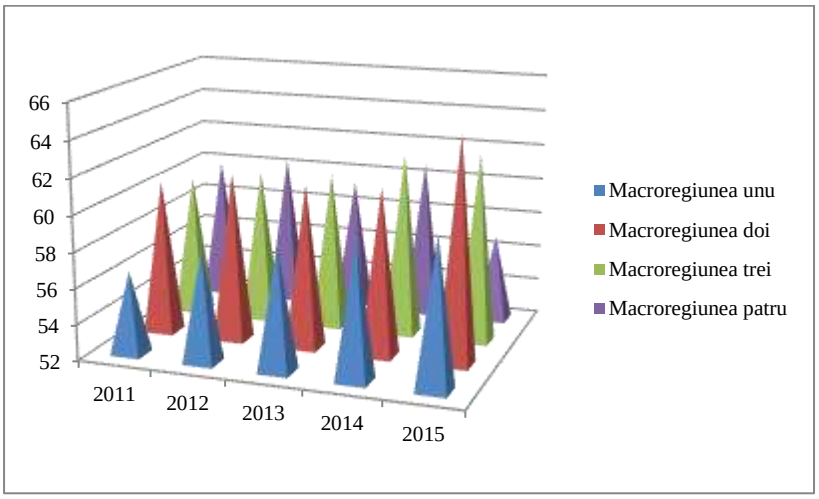

Figure 8. Regional employment rate's trend in Romania (%)

Source: Personal contribution

Across the NUTS 2 regions, Bucuresti-Ilfov and Nord Est achieved employment rates greater than EU average (see Figure 9).

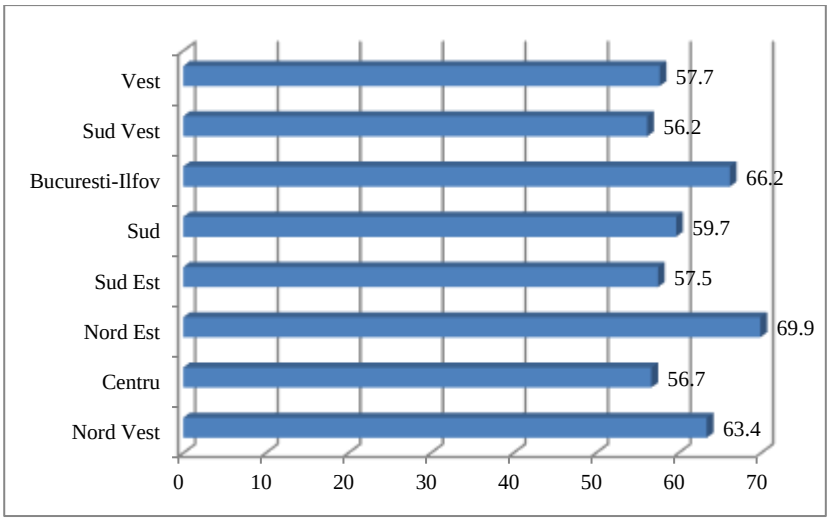

Figure 9. Regional employment rates in 2015 (%)

Source: Personal contribution

Macroregiunea patru faced to an increase in unemployment rate 2015, while the other three succeeded in achieving lower rates (see Figure 10).

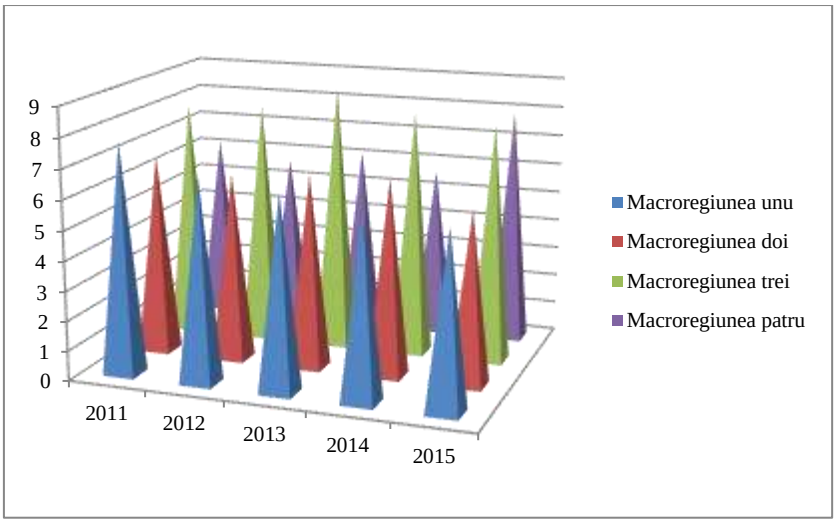

Figure 10. Unemployment rate's trend across Romanian macroregions (%)

Source: Personal contribution

The same indicator led to a gap 2.86: 1 at NUTS 2 level regions in 2015 (see Figure 11).

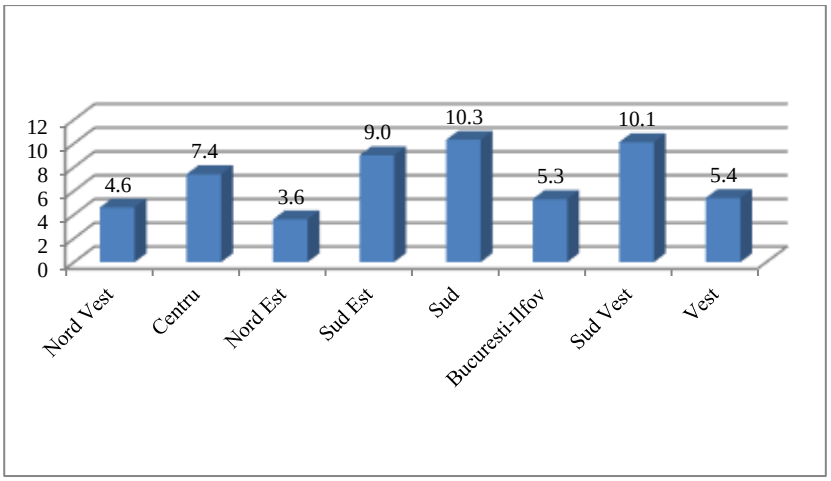

Figure 11. Regional unemployment rates in 2015 (%)

Source: Personal contribution

5. Conclusion

The European Union adopted and implemented strategic documents able to ensure socio-economic development under a sustainable approach. Unfortunately, the latest political and economic events put into discussion even the future of this organization.

Nowadays, the disparities across the Member States increased. The situation is worsening at regional level. Romania represents an ideal example which supports this conclusion.

Under the Brexit's pressure, EU has to find solutions to rebuild the European structures and institutions, in order to obtain again optimal socio-economic development for all Member States. This implies a new approach at supranational and national levels.

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External Debt and Economic Growth: Evidence from Nigeria

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Abstract: The study examined the impact of external debt on economic growth in Nigeria for the period 1981-2014 based on annual data sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues) and abstract of National Bureau of Statistics (NBS). The researcher examined the existence of Co-integration among the underlying variables using Auto-regressive Distributed Lag (ARDL) model after conducting preliminary statistical test to ascertain the normality of the variables as well as stationary of the data set using descriptive and unit root tests. The result of the ARDL test shows that a significant relationship exists between external debt and economic growth both at the long and short run. The study also examined the causality among the variables using Granger causality test and observed that no causality exist among the variables. The study therefore recommends that government should ensure that loans obtained are used to finance profitable projects that would generate reasonable amount of revenue to service the debts and also adequate record of debt payment obligations should be kept and debt should not be allowed to exceed a maximum limit in order to prevent debt overhang.

Keywords: External Debt; Economic Growth; Nigeria; ARDL; Granger Causality

JEL Classification: C13; D4; D24; O4

1. Introduction

This current study attempts to examine the nature of the connection between economic growth and public debt. We intend to know whether or not the relationship is significantly negative and if yes, what is the implication and what policy options are available to the policymakers. The study is country-specific in nature as it focuses mainly on the Nigerian economy. Literature has shown that country-specific research have some salient advantages over cross-section studies

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because it is free from issues associated with the problem of ignoring every country's characteristics that has been experienced in cross-section studies. Although, the proponents of cross-section studies are of the view that all countries possess homogenous economic structure, Forbes (2000) challenges the usefulness of the results of cross-section studies on the ground that it has no specific policy implementation based on the fact that some salient features of individual countries in a group of country being study have been ignored. The author further explained that the homogeneity of countries in cross-section studies cannot be fully ascertained.

The choice of Nigeria is induced by divers arguments by successive administration in Nigeria on the impact of debt on the nation's economic growth as shown in there disposition to public debt usage in the effort to build the economy. For instance, while the Obasanjo's led administration in 2003-2007 strongly pursue debt cancellation which led to drastic reduction of external debt to about $3.4 billion in 2007 from over $42 billion in previous years, the successive governments after Obasanjo have toe the path of debt attraction for instance, the nation's debt have steadily increase from $3.4 billion in 2007 to $3.7 billion in 2008, $3.9 billion in 2009, $4.5 billion in 2010, $5.7 billion in 2011, $6.5 billion in 2012, $9.0 billion in 2013, $9.5billion in January,2015. However, between May 2015 and June, 2016, the country debt had increased by more than $14billion (NBS, 2016). The nation's high rising debt position was one of the key campaign issues in the 2015 general election, yet in just about a year of the new administration, the nation's indebtedness has risen by about ₦4 trillion. The questions are: Is debt contributory to economic growth in Nigeria? In order words, what is the nature of the relationship between debt and economic growth in Nigeria? Does debt Granger causes economic growth? Answering these questions are important to virtually all the various economic agents, for instance, the policy makers will find the response useful in making decision on the best mixture of debt in financing growth in Nigeria.

The remain part of this study is as follows. Section two will focus on literature review, Section three will focus on methodology, and Section four will present the results while Section five concludes the study.

2. Theoretical and Empirical Reviews

Several theories have been promulgated by scholars in a bid to explain the issue of external debt as it relate to economic growth. Some of these theories that are relevant to this study will be discussed in this section, they are: the dual-gap theory; debt overhang theory; crowding-out effect theory; dependency theory and the Solow-growth model.

Dual Gap Theory

The dual gap analysis explained that development is a function of investment, and that investment is essentially a product of domestic savings, which more than often is not adequate to finance development. Given this scenario, government adopts strategies of collecting from abroad the sum that can be invested in the economy, which is usually equal with the sum that is saved. In addition, the domestic resources are to be augmented from abroad, such that we have excess of import over export (i.e. M>E).

I – S

M – E

Hence, I – S = M – E

In national income accounting, surplus of investment over domestic saving is equal to surplus of import over export.

Income = Consumption + Import + Savings

Output = Consumption + Export + Investment

Income = Output

That is, Investment – Savings = Import – Export.

This is the foundation of dual gap analysis; it explains that if the domestic saving available falls short of the level needed to realize the target rate of growth, a savings investment gap is thought to be in existent, thus borrowing is induced. On a similar note, if the maximum import requirement necessary to realize the growth target is larger than the maximum possible level of export, then there is an export-import exchange gap.

Debt Over-Hang Theory

This theory is built on the principle that if the level of debt will surpass the country's ability to repay with some probability in the future, estimated debt service is expected to be a growing function of the country's output level. Therefore some of the returns obtained through investing in the domestic economy are efficiently taxed away by current foreign creditors and the investment made by domestic and new foreign investor is not encouraged. Debt servicing, which includes interest payments and repayments, is likely to be a factual link from an indebted country. It only takes large benefit from the domestic economy to be able to allocate to the foreign economy. Therefore, the country declines some outstanding multiplier-accelerator effects. This reduces the domestic country's growing ability in her economy and increases her dependency on foreign debt (Yucel, 2009; Tamasehke, 1994).

Crowding Out Effect

Under the **crowding out effect**, a decline in the debt service would lead to growth in investment for every given level of future indebtedness, if a larger portion of foreign resources are utilized to service external debt, very little portion is available for investment and growth. In summary, debts overhang hypothesis emphasis that external debt leads to a negative effect on investment. The debtor country cannot profit fully from an upsurge in production (economic growth). A part of the production would go to creditor countries in order to pay the debt service and this fact is a concern for investment and production decisions.

Dependency Theory

Dependency theory states that the poverty of the countries in the periphery is not only because they are not integrated or fully integrated into the world system, as it is often argued by free market economists, but because of how they are integrated into the system. From this standpoint a common school of thought is the Bourgeoisie scholars, who are of the view that the state of underdevelopment and the constant dependence of less developed countries on developed countries are as a result of their domestic mishaps. They believe this issue can be explained by their lack of close integration, diffusion of capital, low level of technology, poor institutional framework, bad leadership, corruption, mismanagement, etc. (Momoh & Hundeyin, 1999). The proponents of this School of Thought see the underdevelopment and dependency of the third world countries as being internally inflicted rather than externally afflicted. To this school of thought, a way out of the problem is for third world countries to seek foreign assistance in terms of aid, loan, investment, etc, and allow undisrupted operations of the Multinational Corporations (MNCs).

Solow Growth Model and External Debt

The Solow growth model is built on a closed economy framework, which makes use of labour and capital as its means of production. Under this scenario the implication of external debt on growth can be seen through its effect on the domestic saving which in turn is use as investment in a closed model. The general effect of external debt on the Solow growth model can be analyzed by looking at the individual effects of the debt overhang and debt crowding theories on the Solow growth model. According to the debt overhang hypothesis, the government in an attempt to amortize the accumulated debt will increase tax rate on the private sector (as means of transferring resources to the public sector). This will discourage private sector investment and also reduce government expenditure on infrastructure as the resources are used to pay up huge debt service payments instead of being put into good use. This will lead to a reduction in total (private and public) investment in the economy and a shift downward of both the investment and production function curves in Solow growth model. On the other hand, in the

case of debt crowding out, in a bid to clear their outstanding debts, the government makes use of their revenue from export earnings and in some cases transfer resources including foreign aid and foreign exchange resources to service their forthcoming debt. Those countries which transfer revenue from export earnings which can be used in investment in the economy to avoid huge debt payments will discourage public investment. This in turn will decrease economic growth and will shift both the investment and production function curves in Solow growth model downward (Dereje, 2013).

Several researchers both within and outside Nigeria have concentrated their research on external debt and economic growth. The result from the studies showed both positive and negative effects of external debt on investment and economic growth. Some of these studies are reviewed below.

Karagoz and Caglar (2016) attempted to provide a unified model to answering the question relating to relevance of debt on economic growth by using pooled regression, fixed effects and random effect models to analysis panel data model of 17 selected OECD countries. The result shows that a positive relationship exist between debt and growth for the OECD countries; the authors argues that, existence of positive relationship in their findings is indicative of good policy administration in the selected OECD countries. A major flaw of Karagoz and Caglar' study is that it fails to justify the choice of the selected 17 OECD countries, besides, it does not factor in some salient issues peculiar to specific country when debt-growth relationship is being considered.

Chen *et al*, (in Press) examined the impact of both the public investment and public debt on economic growth based on data sourced from 1991 – 2014 for a panel of dataset for 65 developed and developing economies. They observed that debt and public investment have positive effect on economic growth up to a point where optimal level is achieved. Any point beyond, the optimal level will have a negative impact on the economy. The author therefore suggest that policy makers should be careful in identifying and keeping momentum with the optimal level when administering either debt or public investment to achieve economic growth (see also Ocampo (2004), Jayaraman & Lau (2009), Checherita-Weatphal & Rother (2012), Ouyang & Rajan (2014), Ramzan & Ahmad (2014)).

For a sample of OECD countries, Panizza and Presbitero (2014) observed that a negative correlation exist between debt and growth. The result further reveals that the link between debt and growth disappears once endogeneity is factored into the model. The study also shows that there is no evidence to support the view that public debt has a causal effect on economic growth for the economies studied.

For some selected 107 economies with 79 episodes of public debt reduction ranging from 1980 – 2012, Baldacci *et al*, (2015) observed that expenditure-based, front loaded fiscal adjustment that are gradual and depends on a mix of revenue

and expenditure measure that can support output expansion, while reducing public debt. The authors concluded that debt enhances growth only to the level of its impact on supply side framework.

Melina *et al* (2016) used Debt, Investment, Growth and National Resources (DIGNAR) model to analyze the connection between the macroeconomic and debt sustainability for some developing resource-rich economies. The study observed that when fiscal adjustment is implementable, the economy is characterized with a delinked public investment approach combined with the resources fund in such a way that makes spending cyclical, with respect to resource revenues, thus driving macroeconomic instability towards a spend-as-you-go approach. The authors cautioned that ambitious frontloading public investment characterized by indiscriminative borrowing can induce debt sustainability risks at the eye of a nose-diving investment efficiency.

Siddique *et al,* (in press) calibrated oil price behavior into growth-debt model. The author argued that fluctuations in oil price cum poor management among others are the factors that makes debt encumbrance on economic growth for a number of Heavily Indebted Poor Countries (HIPCs).

For the Indian economy, Bal and Rath (2014) used the ARDL model to analyze data sourced from 1980 – 2011 so as to examine the effect of public debt on economic growth in India. The authors observed that in line with a priori expectation, in the short run the central government debt, total factor productivity (TFP) growth, and debt services significantly affects economic growth. The study recommends that policy makers should follow the objective of inter-generational equity in fiscal management over long run so as to stabilize debt-GDP ratio for the Indian economy.

Spilioti and Vamvoukas (2015) calibrated fiscal policy indicators affecting growth, openness and external competitiveness as well as demographic factors into the debt-growth nexus model for the Greek economy based on data sourced from 1970 to 2010, and observed that a significant positive relationship exist between economic growth and debt for Greece. The results of Spilioti and Vamvoukas (2015) is similar to that of Bashar *et al* (2012) for Bangladesh; Cevik and Cural (2013) for Turkey; Kasidi and Said (2013) for Tanzania; Uzun *et al* (2012) for a team of 27 transition countries; and Zaman and Arslan (2014) and Fida et al (2011) for Pakistan but contradicts the findings of Zaman and Georgesiu (2015) for Romania.

Dogan and Bilgili (2014) used multivariate dynamic Markov-Switching model to examine the linkages between economic growth and development for the period 1974 to 2009 for the Turkish economy. The study observed that public debt exerts negatively on economic growth and that the negative impact of public debt on economic growth is higher than that of private borrowing on economic growth for

the Turkish economy. The study concludes that economic growth and debt do not follow a linear path[1].

On the direction of causality between debt and equity, Gomez-Piug and Sosvilla-Rivero (2015) documented that a bi-directional causal relationship exist between public debt and economic growth in both the Central and Peripheral countries of European Economic and Monetary Union. They further stated that debt have a negative impact on economic growth for Belgium, Greece, Italy and Netherlands.

Pioneer work on the Nigerian public debt can be traced to Ajayi (1991) who observed that the malfunctions of macroeconomic policies among others are the factors that make debt burdensome on growth. Ever since, a number of researches have been conducted on debt behavior in Nigeria with researchers examining various impact of debt on the nation's economy, for instance, Edo (2002) focused on the impact of foreign debt accumulation in Nigeria, Ajayi and Oke (2012) examined the link between the nation's debt and each of national income and per capital income. On the impact of debt on economic growth, evidence from empirical literature from Nigeria are at best mixed, for instance, while Adegbite et al (2008), Boboye and Ojo (2010), Ezeabasili *et al*, (2011), Osuji and Ozurumba (2013) are of the view that a negative relationship exist between economic growth and debt in Nigeria; Ogunmuyiwa (2011), Sulaiman and Azeez (2012), Abdullahi et al (2015) documented the existence of a positive relationship among the dual. The mixed result of the empirical funding on Nigeria is one of the factors that motivates the current research work

3. Methodology

To investigate the existence of cointegration among the variables studied in this research, this paper adopts one of the contemporary time series techniques of analysis called the Autoregressive Distributed Lag (ARDL) model which was established by Pesaran and Shin (1999) and later extended by Pesaran *et al* (2001). ARDL is lately becoming a popular standard technique used to examine co-integration among financial variable. Our choice of the ARDL model is based on the advantages of the model over the existing cointegration techniques like Engle and Granger (1987), Johansen (1991), Johansen and Juselius (1990) and Gregory and Hansen (1996) for a number of reason: First; it is more appropriate when faced with small sample size (Ozturk and Acaravci (2010); Odhiambo (2010) Babajide *et al* (2015), Babajide and Lawal 2016); second, it is applicable whether or not the underlying regressions are purely I(0), purely I(I) or mutually co-integrated (Marashdeh (2005)); third, the techniques accommodates different optimal lags unlike other conventional co-integration procedures (Bekhet and Matar (2013)).

[1] See also (Asley, 2002, Muhtar, 2004).

These advantages motivate the choice of ARDL procedure in investigating the relationship among the variables. The ARDL model specification is stated in bellow.

3.1. Model Specification

We develop a linear equation model such that:

RGDP=f (EXTDEBT, EX, CPI)…….. (1

The ARDL estimation is as follow: The ARDL estimation is as follow:

$$\begin{aligned}\Delta\mathrm{InRGDP}_t = {} & \beta_{01} + \sum_{i=1}^{n1} \beta_{11}\ \Delta\mathrm{In}RGDP_{i-t} + \sum_{i=0}^{n2} \beta_{12}\ \Delta\mathrm{InEXTDEBT}_{t-i} \\ & + \sum_{i=0}^{n3} \beta_{13}\ \Delta\mathrm{EX}_{t-t}\ + \sum_{i=0}^{n4} \beta_{14}\ \Delta\mathrm{CPI}_{t-i}\phi_{11}\mathrm{InRGDP}_{t-1} \\ & + \phi_{12}\mathrm{In}EXTDEBT_{t-1}\ + \phi_{13}\mathrm{EX}_{t-1} \\ & + \phi_{14}\mathrm{CPI}_{t-1}\ \varepsilon_{t1} \end{aligned} \quad (2)$$

$$\begin{aligned}\Delta\mathrm{InEXTDEBT} = {} & \beta_{01} + \sum_{i=1}^{n1} \beta_{11}\ \Delta\mathrm{In}EXTDEBT_{i-t} + \sum_{i=0}^{n2} \beta_{12}\ \Delta\mathrm{In}RGDP_{i-t} \\ & + \sum_{i=0}^{n3} \beta_{13}\ \Delta EX_{t-t}\ + \sum_{i=0}^{n4} \beta_{14}\ \Delta\mathrm{CPI}_{t-i}\ \phi_{11}\mathrm{InRGDP}_{t-1} \\ & + \phi_{12}\mathrm{In}EXTDEBT_{t-1}\ + \phi_{13}\mathrm{EX}_{t-1} \\ & + \phi_{14}\mathrm{CPI}_{t-1}\varepsilon_{t1} \end{aligned} \quad (3)$$

$$\begin{aligned}\Delta\mathrm{EX} = {} & \beta_{01} + \sum_{i=1}^{n1} \beta_{11}\ \Delta EX_{i-t} + \sum_{i=0}^{n2} \beta_{12}\ \Delta\mathrm{In}RGDP_{i-t} \\ & + \sum_{i=0}^{n3} \beta_{13}\ \Delta\mathrm{InEXTDEBT}_{t_{t-t}} \\ & + \sum_{i=0}^{n4} \beta_{14}\ \Delta\mathrm{CPI}_{t-i}\ \phi_{11}\mathrm{InRGDP} + \phi_{12}\mathrm{In}EXTDEBT_{t-1} \\ & + \phi_{13}\mathrm{EX}_{t-1} \\ & + \phi_{14}\mathrm{CPI}_{t-1}\varepsilon_{t1} \end{aligned} \quad (4)$$

$$\Delta \mathrm{CPI} = \beta_{01} + \sum_{i=1}^{n1} \beta_{11}\ \Delta \mathrm{CPI}_{\ i-t} + \sum_{i=0}^{n2} \beta_{12}\ \Delta \mathrm{In}RGDP_{i-t} + \sum_{i=0}^{n3} \beta_{13}\ \Delta \mathrm{InEXTDEBT}_{t_{t-t}} + \sum_{i=0}^{n4} \beta_{14}\ \Delta EX_{t-i}\ \phi_{11}\mathrm{InRGDP}_{t-1} + \phi_{12}\mathrm{In}EXTDEBT_{t-1} + \phi_{13}\mathrm{CPI}_{t-1} + \phi_{14}\mathrm{EX}_{t-1}\varepsilon_{t1} \quad (5)$$

Where *In* is the log of the variables, RGDP represent the Real Gross Domestic Product; EXTDEBT represent external debt; EXC represent exchange rate and CPI represent consumer price index Δ represents the first difference operator, β_{01} …..β_{04} are the constant terms; β_{11} ….β_{55} represents the short run coefficients, ϕ_{11} …..ϕ_{44} Are the long run coefficients, n_1 ….n_4 are the lag length and ε_{t-1} ….. ε_{t-4} represents the white noise error terms.

We formulate the H_0 and H_1 hypothesis as shown below so as to test for existence of short run β_1 and long runϕ_S.

H_0: no long-run relationship	H_1: a long-run relationship
$\phi_{11} = \phi_{12} = \phi_{13} = \phi_{14} = 0$ $\phi_{21} = \phi_{22} = \phi_{23} = \phi_{24} = 0$ $\phi_{31} = \phi_{32} = \phi_{33} = \phi_{34} = 0$ $\phi_{41} = \phi_{42} = \phi_{43} = \phi_{44} = 0$	$\phi_{11} \neq \phi_{12} \neq \phi_{13} \neq \phi_{14} \neq 0$ $\phi_{21} \neq \phi_{22} \neq \phi_{23} \neq \phi_{24} \neq 0$ $\phi_{31} \neq \phi_{32} \neq \phi_{33} \neq \phi_{34} \neq 0$ $\phi_{41} \neq \phi_{42} \neq \phi_{43} \neq \phi_{44} \neq 0$

H_0: no short-run relationship	H_1: a short-run relationship
$\beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = 0$	$\beta_{11} \neq \beta_{12} \neq \beta_{13} \neq \beta_{14} \neq 0$
$\beta_{21} = \beta_{22} = \beta_{23} = \beta_{24} = 0$	$\beta_{21} \neq \beta_{22} \neq \beta_{23} \neq \beta_{24} \neq 0$
$\beta_{31} = \beta_{32} = \beta_{33} = \beta_{34} = 0$	$\beta_{31} \neq \beta_{32} \neq \beta_{33} \neq \beta_{34} \neq 0$
$\beta_{41} = \beta_{42} = \beta_{43} = \beta_{44} = 0$	$\beta_{41} \neq \beta_{42} \neq \beta_{43} \neq \beta_{44} \neq 0$

Deciding on either to reject or accept H_0 (no co-integration among the variables) is based on the following criteria:

If F- Statistics (F_s) > upper bond, then we reject H_0, thus the variables are co-integrated;

If F_s < lower bound, then we accept H_0, thus we conclude that the variables are not co-integrated.

But if $F_s \geq$ lower bound and $\leq$ Upper bound, under this condition, the decision is inconclusive.

The Granger causality test is as follows:

$$\mathrm{RGDP}_t = \sum_{i=1}^{n} \alpha i \; EXTDEBT_{t-i} + \sum_{j=1}^{n} \beta_j RGDP_{t-j} + \varepsilon_{t1} \quad (6)$$

$$\mathrm{EXTDEBT}_t = \sum_{i=1}^{n} \alpha i \; RGDP_{t-i} + \sum_{j=1}^{n} \beta_j EXTDEBT_{t-j} + \varepsilon_{t1} \quad (7)$$

4. Results and Discussion

4.1. Unit Root Test

Table 1. Result of the adf unit root test

Variables	ADF t-statistics	Critical values	Prob.	Lag	Inference
RGDP	-5.388094	-2.639210	0.0000	0	I(1)
EXTDEBT	-4.277351	-2.639210	0.0001	0	I(1)
EX	-4.853710	-2.639210	0.0000	0	I(1)
CPI	-6.079591	-2.639210	0.0000	0	I(1)

Source: Authors Computation (2016) using E-view 7

Table 2. Result of the p-p unit root test

Variable	P-P t- statistics	Critical values	Prob.	Inference
RGDP	-5.387940	-2.639210	0.0000	I(1)
EXTDEBT	-4.286336	-2.639210	0.0001	I(1)
EX	-4.875464	-2.639210	0.0000	I(1)
CPI	-6.079591	-2.639210	0.0000	I(1)

Source: Authors Computation (2016) using E-view 7.

The results of the unit root test are displayed in Table 1 and 2. It is evident that all the variables t-statistics have more negative results than the critical values at 1%, 5% and 10% level, thus we reject the null hypothesis of unit root test in the series. Beyond this, the t- values for variables; RGDP, EXTDEBT, EX and CPI are integrated at order 1.

4.2. Granger Causality Test

Real Gross Domestic Product and External Debt

D(RGDP) does not Granger Cause D(EXTDEBT)	31	0.04058	0.9603
D(EXTDEBT) does not Granger Cause D(RGDP)		0.03312	0.9675

Source. Author Computation (2016) Using E-Views 7

The Null Hypothesis

H0a: RGDP does not granger cause EXTDEBT

H0b: EXTDEBT does not granger cause RGDP

Alternative Hypothesis

H1a: RGDP granger cause EXTDEBT

H1b: EXTDEBT granger cause RGDP

Our main focus is on the causal relationship between Real Gross Domestic Product and External debt. But from the table above the table above the probability value is greater than 0.05 which means that Real gross domestic product does not granger cause External debt and External debt does not granger cause Real gross domestic product. So we cannot reject the null hypothesis instead we accept it.

4.3. Ardl Result

No of lags	Akaike info criterion	Schwarz criterion
4	-2.257097	-1.266986
3	-2.211287	-1.417275
2	-2.017153	-1.363260

Source. Authors Computation (2016) using E-view 7.

Test for Long run relationship

H0: C18 = C19 = C20 = C21 = 0

H1: C18 = C19 = C20 = C21 ≠ 0

Pesaran critical value at 5% level at significance. The model is unrestricted with intercept and no trend and the F-statistic is 7.823. From the table, the lower bound value is 3.79 and the upper bound value is 4.85. The F-statistic is more than the upper bound value, we can reject the null hypothesis since 7.823 is greater than 4.85.

From the ARDL and the Error Correction Model results, we can deduce that there is co-integration among the variables which means that there is a significant relationship between economic growth and macro-economic variables so we reject the null hypothesis.

5. Conclusion and Policy Implications

This study investigated the impact of external debt on economic growth in Nigeria. Annual data from Central Bank of Nigeria Statistical Bulletin 2015 for the period 1981 to 2014 were used. The study sought to know whether or not there exist a significant relationship between external debt and economic growth in Nigeria. The Real Gross Domestic Product was used as a proxy for economic growth which is the dependent variable while external debt, exchange rate and consumer price index were the independent variables. External debt, exchange rate and consumer price index were used to explain the external debt burden.

The ARDL estimates and Error correction model was used to test the first hypothesis of no significant long run relationship between external debt and economic growth. The null hypothesis was rejected as the result showed that a long run relationship exist between external debt and economic growth. The granger causality test was employed to test the second hypothesis of no causal relationship between external debt and economic growth in Nigeria. The null hypothesis is accepted as the result shows no causal relationship between external debt and economic growth.

Based on the results of the estimates, the study recommends that government and policy makers should stop accumulation of external debt stock overtime and prevent concealing of the motive behind external debt; external debts should be obtained mainly for economic reasons (productive purposes) and not for social or political reasons. Adequate record of debt payment obligations should be kept by the authorities responsible for managing Nigeria's external debt and the debt should not be allowed to exceed a maximum limit in order to evade debt overhang. The Nigerian government should also encourage the exportation of domestic products as high exchange rate will enable our goods to be more attractive in the foreign market which will increase foreign exchange earnings and promote the growth of our infant industries.

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The Role of the Monetary Policy in the Context of the Macroeconomic Policies Mix –A Fiscal and Monetary Policy Case Study for Romania

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Abstract: The main object of the research is to analyze and identify an optimal monetary and fiscal policy model that responds to the economic problems of the countries from Central and East Europe and, mainly, of Romania. Given the vulnerabilities of the Central and Eastern Europe region at the beginning and during the recent global economic and financial crisis, there is an increased interest to identify the models that can explain the main features of the Central and Eastern Europe macroeconomic data: GDP, inflation rate, the nominal interest rate, the weight of governmental expenses and public debt in GDP. Moreover, due to the importance of the uncertainty in modelling the monetary policy and to the increasing attention that central banks should pay to the anticipation of the future macroeconomic conditions, another objecive of the research is to identify the significant shocks that influence the macroeconomic environment, such as: productivity (technology) shock, world output shock, mark-up shock, interest rate shock, tax shock and spending shock.

Keywords: monetary; fiscal; policy; shocks; Bayesian

JEL Classification: C01; D50; B22; C4

1. Introduction

Given the vulnerabilities of the countries from Central and East Europe at the beginning and during the recent economic and financial global crisis, there is an increasing interest to identify models that explain the most significant characteristics of the macroeconomic variables, such as: GDP (gross domestic product), inflation rate (GDP deflator), nominal interest rate, public debts and governmental expenses.

As a result, the main object of the research is to analyze and identify an optimal monetary and fiscal policy model that complies with the macroeconomic context and responds to financial and economic problems of the countries from Central and East Europe and, mainly, of Romania.

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Generally, central banks put an eye on the importance of uncertainty in shaping monetary policy (e.g., as in Greenspan A. (2004)), uncertainty that can take many forms. The central bank must act in anticipation of future macroeconomic conditions, which are affected by shocks that are currently unknown.

Given the importance of the uncertainty in modelling the monetary policy in terms of future shocks, another objective of the research is to identify which are the significant shocks that influence the macroeconomic environment.

As a result, I have proposed during the current thesis to consider how monetary and fiscal policy should be conducted in the face of multiple sources of uncertainty, including model and parameter uncertainty as well as uncertainty about future shocks.

In this purpose the analyzed model proposes the interdependent analysis of the monetary and fiscal policy, through the analysis of the impulse response function of the variables from the model.

For the analysis we have taken into consideration 5 observed variables: GDP, inflation rate (measured based on the GDP deflator), the nominal interest rate, the weight of governmental expenses and public debt in GDP and also 6 exogenous shocks: productivity (technology) shock, world output shock, mark-up shock, interest rate shock, tax shock and spending shock.

The thesis is organized as follows: section 1-Introduction, section 2 contains the description of the model, section 3 describes the econometric estimation methodology, description of the parameters calibration and data set and also the results of the parameters estimates, section 4 is the section of conclusions, followed by References section.

2. The Model

The model proposed as in Cem, C. (2011) supposes a standard small-scale open economy New Keynesian model, in accordance with the model proposed by Lubik and Schorfheide (2007), modified in order to include the effects of fiscal policy. Moreover, the model can also be considered a modified version of that proposed by Gali and Monacelli (2005) that includes also fiscal policy, as in Fragetta and Kirsanova (2010).

The agents involved by the model are the following ones: the private sector represented by households, the producers, the monetary and fiscal policy authorities.

Another hypothesis of the model is the fact that there is a continuum of identical monopolistically competitive firms in the economy that produce domestic goods. The same situation is in case of firms that produce imported goods.

2.1. Private Sector

This sector is formed by infinite lived households who try to maximize the expected present discounted value of the lifetime utility, as follows:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma}}{1-\sigma} + \chi \frac{G_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi}\right) \quad (1), \text{ where:}$$

$\beta \in (0,1)$ represents the discount factor of the households;

σ is the inverse intertemporal elasticity of substitution in consumption;

φ is the inverse labour supply elasticity with respect to real wage and

χ is the relative weight on consumption of public goods.

The variables C_t, G_t and N_t represents the private consumption, the governmentt spending and, respectively, the labour supplied (measured in terms of number of hours of work).

The inter-temporal budget constraint of households is the following:

$$P_t C_t + E_t\{Q_{t,t+1} D_{t+1}\} + T \le D_t + (1-\Psi_t) W_t N_t \quad (2), \text{ where:}$$

$Q_{t,t+1} = (1/1+r_t)$ represents the stochastic discount factor for one-period ahead;

r_t is the nominal interest rate;

T represents the constant lump-sum taxes;

Ψ_t represents the income tax rate;

W_t is the nominal wage;

D_t is nominal portfolio;

P_t is consumer price index (CPI) and

C_t is composite consumption index which that contains an index of domestically produced goods ($C_{H,t}$) and of imported goods, ($C_{F,t}$).

Through the forward looking open economy IS curve proposed by Gali & Monacelli (2005) a log-linearized IS curve in terms of deviations from steady state can be expressed as follows:

$$\hat{y}_t = E_t\{\hat{y}_{t+1}\} - E_t\{\Delta\hat{g}_{t+1}\} + \alpha(\varpi - 1)(\rho_{c^*} - 1)\hat{c}_t^{\,*} - \frac{1}{\sigma_\alpha}(\hat{r}_t - E_t\{\hat{\pi}_{H,t+1}\}), \quad (3)$$

Where: $\sigma_\alpha \equiv \frac{\alpha}{(1-\alpha)+\alpha\varpi}$ and $\varpi \equiv \sigma\gamma + (1-\alpha)(\sigma\eta - 1)$.

η>0 is the elasticity of substitution between domestic and foreign goods;

α is the share of domestic consumption allocated to imported goods (degree of openness)

γ is the elasticity of substitution between the goods produced in different foreign countries.

The obtained forward looking open economy IS curve obtained through processing in the gap form is as follows:

$$\tilde{y}_t = E_t\{\tilde{y}_{t+1}\} - E_t\{\Delta\tilde{g}_{t+1}\} - \frac{1}{\sigma_\alpha}(\tilde{r}_t - E_t\{\tilde{\pi}_{H,t+1}\}), \quad (4), \text{ where:}$$

$\tilde{y}_t = \hat{y}_t - \hat{y}_t^{\,n}$, $\tilde{r}_t = \hat{r}_t - \hat{r}_t^{\,n}$.

$\tilde{g}_{t+1} = \hat{g}_{t+1}$ and $\tilde{\pi}_{H,t+1} = \hat{\pi}_{H,t+1}$, since $\hat{g}^{n}{}_{t+1} = \hat{\pi}^{n}{}_{H,t+1} = 0.$

$\hat{y}_t^{\,n}$ and $\hat{r}_t^{\,n}$ represent the natural level of output and of nominal interest rate, respectively.

The equilibrium level of output and interest rates for the model without nominal rigidities are:

$$\hat{y}_t^{\,n} = \frac{(1+\varphi)}{(\sigma_\alpha + \varphi)}\hat{a}_t - \frac{(\sigma - \sigma_\alpha)}{(\sigma_\alpha + \varphi)}\hat{c}_t^{\,*} \quad (5),$$

$$\hat{r}_t^{\,n} = \sigma_\alpha(E_t\{\hat{y}^{n}{}_{t+1}\} - \hat{y}_t^{\,n}) + \sigma_\alpha\alpha(\varpi - 1)(\rho_{c^*} - 1)\hat{c}_t^{\,*} \quad (6),$$

Where a_t is log of technology process, A_t.

2.2. Firms Behaviour and Price Setting

The model supposes that each firm produces a differentiated good using linear technology, so a firm's production function is described as follows: $Y_t = A_t N_t(j)$ (7).

Similar with the hypothesis proposed by Calvo (1983), the model assumes that a fraction of $1-\theta$ of the firms can set a new price in each period, while the remaining θ of the firms keep the price unchanged. As a result, the fraction 1/($1-\theta$) represents the average duration of fixed prices.

The price, $p_{H,t}{}^{b}$, chosen by rule of thumb price setters, is written as in Gali and Gertler (1999):

$p_{H,t}{}^{b} = P_{H,t-1}{}^{*} \frac{P_{H,t-1}}{P_{H,t-2}}$, (8) where $P_{H,t-1}{}^{*} = (P^{b}_{H,t-1})^{\zeta}$ is the aggregate price chosen in the period t-1 by both optimizing (forward looking, $P^{f}_{H,t-1}$) and rule of thumb (backward looking, $P^{b}_{H,t-1}$) price setters.

The log-linearized open economy hybrid Philips curve in terms of deviation from steady state is as follows:

$\hat{\pi}_{H,t} = \lambda^{b}\hat{\pi}_{H,t-1} + \lambda^{f} E_t\{\hat{\pi}_{H,t+1}\} + \kappa \hat{mc}_t + \varepsilon^{\pi}_t$ (9)

$\hat{mc}_t = (\sigma_\alpha + \varphi)(\hat{y}_t - \hat{y}_t{}^{n}) - \sigma_\alpha \hat{g}_t + \hat{\tau}_t$ (10), where $\lambda^{b} = \frac{\zeta}{\theta + \zeta(1-\theta(1-\beta))}$,

$\lambda^{f} = \frac{\beta\theta}{\theta + \zeta(1-\theta(1-\beta))}$ and $\kappa = \frac{(1-\beta\theta)(1-\theta)(1-\zeta)}{\theta + \zeta(1-\theta(1-\beta))}$.

$\hat{mc}_t$ is the real marginal cost and $\tau_t = -\ln(1-\psi_t / Y_t)$ is a log-linearized tax rate.

ε^{π}_t is a cost push (mark-up) shock which is included in the Philips curve according with Smets and Wouters (2003, 2007).

2.3. Monetary Policy

The model supposes a simple Taylor interest rate rule, based on inflation and output gap, as described below:

$\hat{r}_t = \rho_r(\hat{r}_{t-1} - \hat{r}_{t-1}{}^{n}) + (1-\rho_r)[r_\pi \hat{\pi}_{H,t} + r_y(\hat{y}_t - \hat{y}_t{}^{n})] + \hat{r}^{n}_t + \varepsilon^{r}_t$ (11), where:

$\hat{r}^{n}_t$ represents the natural level of nominal interest rate;

ρ_r $(0 \leq \rho_r \leq 1)$ represents the interest rate smoothing coefficient;

ε_t^r represents an i.i.d (independent and identically distributed) interest rate shock.

The explanation of the monetary policy rule is that Central Banks changes the nominal interest rates in response to deviation of the inflation and output from the steady state value and, respectively, from the natural level of output.

Moreover, as proposed by the monetary policy rule, Central Banks also take into account the past values of the nominal interest rate (where $\rho_r \neq 0$) in setting the current nominal interest rate.

2.4. Fiscal Policy

The fiscal policy rule takes into consideration the lagged responses of fiscal policy to economic activity, as follows:

$$\hat{g}_t \equiv \rho_g \hat{g}_{t-1} + (1-\rho_g)[g_y(\hat{y}_{t-1} - \hat{y}^n{}_{t-1}) + g_b \hat{b}_t] + \varepsilon_t^g \quad (12)$$

$$\hat{\tau}_t = \rho_\tau \hat{\tau}_{t-1} + (1-\rho_\tau)[\tau_y(\hat{y}_{t-1} - \hat{y}^n{}_{t-1}) + \tau_b \hat{b}_t] + \varepsilon_t^\tau \quad (13)$$

Parameters ρ_g and ρ_τ indicate the degree of fiscal smoothing, while parameters g_y and τ_y represent the sensitivities of government spending and tax to past value of output gap.

Parameters g_b and τ_b are the feedback coefficients on unobservable debt stock and

ε_t^g and ε_t^τ are independent and identical distributed government spending and tax shocks, which represent the non-systematic component of discretionary fiscal policy or discretionary exogenous deviations from the fiscal rules.

To conclude, the fiscal policy has two objectives: output stabilization and debt stabilization.

2.5. Government Solvency Constraint

A log-linearized government solvency constraint (fiscal constraint) is expressed as follows:

$$\hat{b}_{t+1} = \hat{r}_t + \frac{1}{\beta}[\hat{b}_t - \hat{\pi}_{H,t} + (1-\beta)(\hat{\tau}_t - \hat{y}_t) + \frac{\overline{C}}{\overline{B}}(\hat{g}_t - \hat{\tau}_t)], \quad (14)$$ where:

$b_t = \ln(B_{t/} P_{H,t-1})$, B_t is the nominal debt stock, $\overline{B}$ is the steady state debt to GDP ratio and $\overline{C}$ is the steady state consumption to GDP ratio.

In conclusion, the analyzed model consists of the following: a forward looking IS curve, a hybrid Philips curve, monetary and fiscal policy rules and government solvency constraint.

The observed variables are: output, inflation, nominal interest rate, tax to GDP ratio and spending to GDP ratio, while the un-observed variables are: debt stock, natural level of output and of nominal interest rates.

The model suppose that the stochastic behaviour of the system is driven by te following six exogenous disturbances: productivity (technology) shock, world outphut shock, mark-up shock, interest rate shock, tax shock and spending shock.

3. Econometric Estimation Methodology

3.1. Econometric Methodology

For the analysis of the interaction between the fiscal and monetary policy and of their role in the macroeconomic stabilization I will use the Bayesian approach, using Matlab program and Dynare tool.

Based On this approach I will obtain estimations using the a-priori distributions proposed of the parameters and the observed variables of the model (extracted with Kalman filter, through the maximization of the likelihood function).

Moreover, using the Bayesian approach I can take into account in the analysis also the shocks proposed by the model in order to estimate the standard deviations, with a role in interpreting the impulse response functions.

The obtained results will be interpreted from the perspective of the decomposition of the istorical variance of the analyzed variables, of the MCMC (Makov Chain Monte Carlo) convergence graphs, obtained though the optimization using the Metropolis-Hastings algorithm, the a-priori and, respectively, a-posteriori distributions, the stabilization of the system (through the verification of Blanchard-Kahn condition), of the graphic interpretation of the impulse response functions and of the shocks.

3.2. Calibration and A-Priori Distributions of the Parameters

In terms of the parameters of DSGE model, I will use in the research the Bayesian estimation method, using the likelihood function and the a-priori distributions of the model's parameters, in order to obtain the a-posteriori functions. This a-posteriori function is afterwards optimized through the mothod of Markov-Chain-Monte-Carlo simulation, using 350,000 iterations.

In order to compute the likelihood function for the observed data series, I use Kalman filter, similarly to the proposal of Sargent T.J. (1989) and, afterwards,

through the combination of the likelihood function with the a-priori distribution of the parameters, it will be obtained the a-posteriori distribution of parameters.

It should be also taken into consideration the fact that it is necessary to set fixed values for a part of the parameters during the estimation. Most of those parameters are in a direct connection with the steady-state values of the state variables and can be estimated starting from the average of the observed variables (or the linear combination of them).

The parameters fixed through calibration are: the discount factor (β =0.998) calculated based on the medium interest rate ROBOR 3M as 1/(1+ROBOR 3M/4), taking into consideration the quarterly frequency of the observed variables of the model, τ representing the income tax rate and is calibrated to 16%, α represents the average degree of openness of the economy (the average weight of imports in GDP) being calibrated at 0.38 , η represents the elasticity of substitution between the external and internal consumption and is calibrated at 1, and the average weight of the consumption in GDP, at the steady-state point, θ, is calibrated to 0.7 (as described in the table 1 below).

Moreover, in order to establish the a-priori distributions, I took into consideration the nature of the series, establishing invers gamma distributions with two degrees of freedom for the standard deviations of the estimated exogenous shocks, normal distributions for the parameters with the average 0 and beta distributions for the parameters in the range (0,1), as described in figure 1 below.

Regarding the establishment of the a-priori distributions (as illustrated in figures 1, 2 and 3 below), I assumed that the standard deviations of the structural shocks have inverse gamma distributions (given the sign restriction), while parameters with compact support are assumed to follow beta distributions and the remaining parameters follow normal and gamma distributions.

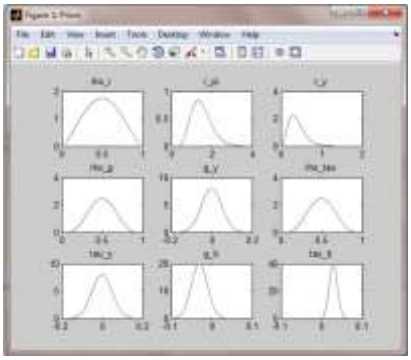

Figure 1. A-priori distributions

Source: Econometric application Matlab

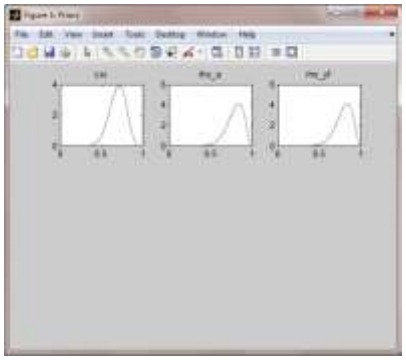

Figure 2. A-priori distributions

Source: Econometric application Matlab

Figure 3. A-priori distributions

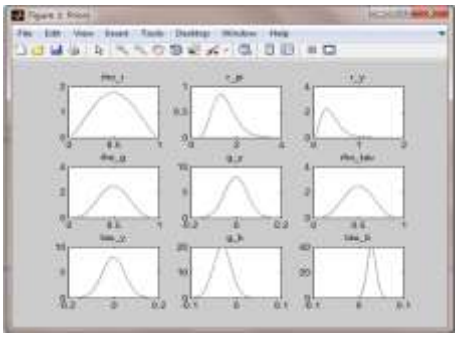

Table 1. Fixed parameters through calibration

Parameter	Value
β	0.998
τ	16%
α	0.38
η	1
θ	0.7

Source: Econometric application Matlab

3.3. Parameters Estimation

In addition to the a-priori distribution, it is important also the estimation of the parameters' a-posteri distribution and of the standard deviation of the shocks, with or without optimization, using the Metropolis-Hastings algorithm (see table 2 and table 3 below).

The results obtained using Dynare tool, in Matlab program, are structured in two sets of results regarding the estimation of the parameters.

As a result, the first set of results contains the a-posteriori values obtained through the maximization of the logarithm of the a-posteriori distributions based on the most frequent values of the parameters (mode) and the standard errors approximated based on Hessian matrix. The second set of information includes the results of the a-posteriori distribution of the parameters, obtained through the Metropolis- Hastings algorithm, for a number of 350,000 iterations. Bsed on this information, taking into account the value associated to the test t-statistic I could verify that the parameters are significantly different from zero.

Table 2. Estimated parameters

prior	mean	mode	s.d.	prior	pstdev
θ	0.5	0.2004	0.0518	beta	0.1
φ	2	2.6688	0.3905	norm	0.5
σ	3	1.3113	0.0137	norm	0.75
ρ_r	0.5	0.613	0.0716	beta	0.2
r_π	1.5	2.2553	0.1766	gamm	0.5

r_y	0.4	0.2348	0.064	gamm	0.2
ρ_g	0.5	0.8938	0.0431	beta	0.15
g_y	0	0.0444	0.0483	norm	0.05
ρ_τ	0.5	0.967	0.0087	beta	0.15
τ_y	0	0.0322	0.0491	norm	0.05
g_b	-0.03	0.0085	0.0025	norm	0.02
τ_b	0.03	0.0238	0.01	norm	0.01
ξ	0.7	0.2604	0.0636	beta	0.1
ρ_a	0.8	0.9757	0.0139	beta	0.1
ρ_{yf}	0.8	0.9974	0	beta	0.1

Source: Econometric application Matlab

Table 3. Standard deviation of shocks

Param.	Medie	Mode	Std. dev.	Distrib. a-priori	Pstdev
ε_a	1	0.1224	0.0114	Invg	4
ε_{pi}	0.6	0.1349	0.022	Invg	4
ε_{yf}	5	4.5421	0.7439	Invg	4
ε_r	0.4	0.0714	0.0105	Invg	4
ε_g	2	0.2579	0	Invg	4
ε_τ	1	0.1422	0.0134	Invg	4

Source: Econometric application Matlab

3.4. Data Set

Once the macroeconomic observed variables that will be used for the estimation of the model and the time period of analysis are established, it is necessary the seasonal adjustment of the variables and the test of stationarity, using the Philips-Perron (PP) or Augmented Dickey Fuller (ADF) test.

Once the observed variables are seasonally adjusted and tested for stationarity in Eviews, these are imported in Matlab for a further processing using Dynare 4.4.0 tool.

For the set of observed variables, the output of Dynare used for the analysis consists of the following:

- A-priori distributions graphs analysis;

- The results of a-posteriori optimization (including the maximum likelihood function);
- The graphs of the shocks, of the historical variables and of the observation errors;
- The impulse response functions of the shocks;
- Historical variance decomposition;
- The MCMC convergence graphs (Markov Chain Monte Carlo);
- Results of studying the stability of the system (Blanchard-Kahn conditions).

The observed variables used in the model are represented by the following 5 series of macroeconomic indicators: GDP, GDP deflator, the nominal interest rate, the weight of the governmental expenses in PIB and the weight of the public debt in GDP, with a quarterly frequence.

As a result, the data set will be collected from Eurostat Database and European Central Bank (ECB), National Bank of Romania (NBR) for the period: 2000 first quarter 1 – 2014 quarter 4.

The GDP data was collected from Eurostat database, being expressed in RON millions and seasonally adjusted.

The GDP data was deflated with the GDP deflator, in order to obtain the real variable and is expressed in percentage variation of the GDP, compared with the previous quarter, in order to obtain an evidence of the real evolution rates (more precisely, it is expressed as a difference of the natural logarithm of GDP at the moment t, compared with the previous period, t-1).

In case of GDP deflator, the index is computed based on the percentage evolution, compared with the previous period (GDP in current prices).

In terms of monetary policy, given the high volatility of the Overnight interest rate (ON), I have used the quarterly interest rates computed based on the daily ROBOR 3M interest rate for the period 2000q1- 2014 q4. So, I have computed an average interest rate for the 60 periods (quarters) from the period 2000 quarter 1 – 2014 quarter 4.

The series of governmental expense expressed as weight in GDP and, respectively, public debt expressed as weight in GDP are collected from the Eurostat site (**gov_q_ggnfa** and **gov_q_ggdebt** -ESA 95 for the period before 2014 and **gov_10q_ggnfa**, **gov_10q_ggdebt**-ESA 2010 for data in the period 2014q1 -2014 q4).

The data series used in Dynare tool for these observed variables are represented by the natural logarithm of the weights in GDP, seasonally adjusted.

The seasonally adjusted and tested for stationarity series are imported in Matlab, for further processing using Dynare 4.4.0 tool.

3.5. Results

As a summary of the model, it is formed by the following: 8 variables (out of which 8 state variables and 0 static variables), 6 stochastic shocks, and 3 forward looking variables (jumpers).

From the analysis of the shocks and endogenous variables results that shocks realizations are around the value of 0 (being considered "white noises").

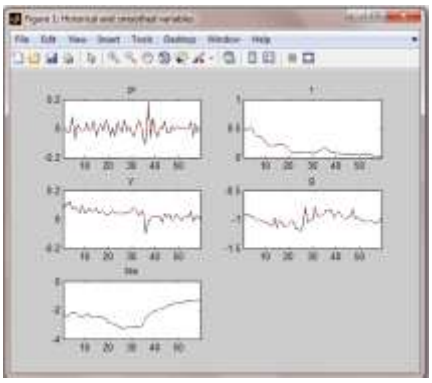

Figure 4. Smoothed variables

Source: Econometric application Matlab

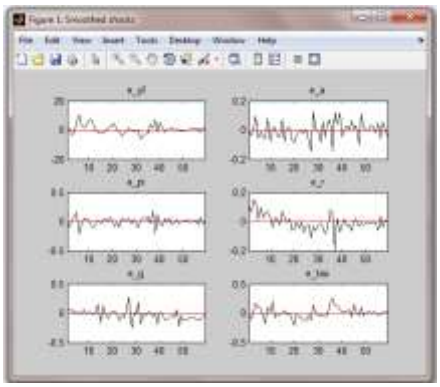

Figure 5. Smoothed shocks

Source: Econometric application Matlab

The Analysis of the Impulse Response Functions

The figures below illustrate the results of the impulse response functions analysis of the 5 observed variables and of the un-observed variable public debts, for a confidence range of 90%.

As results from the figure 6, the shock of the world output (that can be a shock of shock of preferences or a demand shock) leads to the decrease of GDP and of the nominal interest rate, compared with the steady-state point. The decrease of the nominal interest rate leads to the decrease of of the public debt and, as a result, the fiscal authority increases the governmental expenses and reduces taxes. As a result, the inflation rate decreases and the Central Bank will maintain the interest rate to a decreased level, in order to diminish the deflationary pressure.

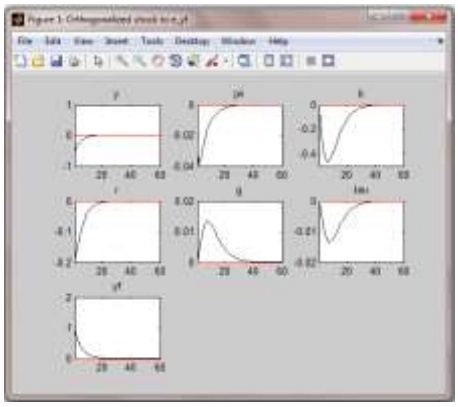

Figure 6. Impulse response function- ε_{yf}

Source: Econometric application Matlab

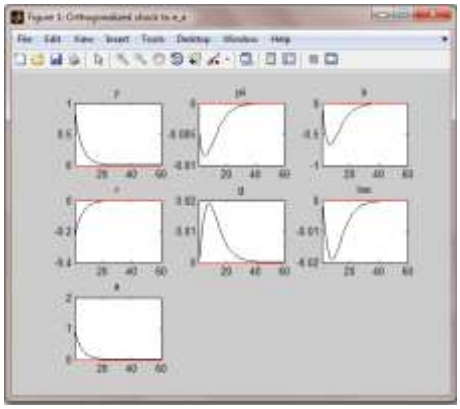

Figure 7. Impulse response function- ε_{a}

Source: Econometric application Matlab

As results from the figure 8, at a prices shock, the nominal interest rate increases for the stabilization of the inflation. Even though the nominal interest rate increases, the public debt decreases as a result of inflation effect. In order to bring the GDP and public debt back to the steady-state level, the government implements an expansionist fiscal policy, through the decrease of the tax level and the increase of governmental expenses.

A positive shock of the nominal interest rate leads to the decrease of inflation and GDP (figure 9). The high level of interest rate leads also to the increase of public debt. As a result, for the stabilization of the debt, the fiscal authority intervenes through the decrease of governmental expense and the increase of taxes. The decrease of governmental expenses and the increase of taxes will lead also to the stabilization of inflation.

As a result, a tightening monetary policy is followed by a tightening fiscal policy, on the basis of the decrease of the governmental expenses and the increase of the

tax level.

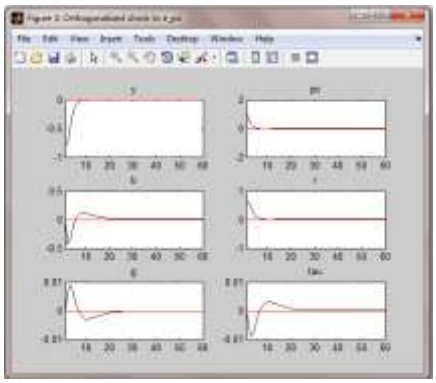

Figure 8. Impulse response function- ε_{pi}

Source: Econometric application Matlab

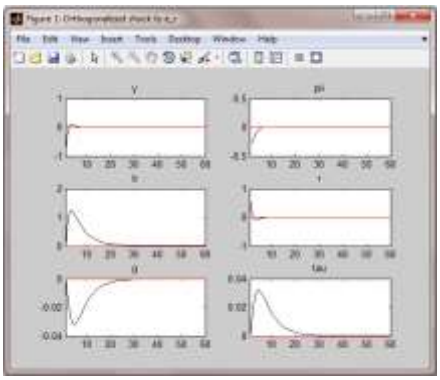

Figure 9. Impulse response function- ε_{r}

Source: Econometric application Matlab

A positive shock of the governmental expenses (figure 10) leads to the increase of GDP and of the inflation rate. As a result, the Central Bank, as the authority responsible with the monetary policy, will take the decision to increase the interest rate. The increase of governmental expenses, followed by the increase of the nominal interest rate will lead to the increase of the public debt. In order to achieve the stabilization of the public debt, the fiscal authorities decide the increase of taxes. As a result, an expansionist fiscal policy through the increase of governmental expenses is followed by a tightening monetary policy and subsequently, by a tightening fiscal policy, through the increase of taxes.

A shock of taxes (as illustrated by figure 11) leads to the increase of the marginal cost and, as a result, an increase of the inflation rate. As a result of the increasing inflation, the nominal interest rate increases too, at the incentive of the Central Bank. To conclude, the increase of taxes and inflation rate leads to the decrease of the public debt, having a stronger effect than the increase of the interest rate. As a result, a tightening fiscal policy through the increase of taxes leads to the adoption by the Central Bank of a tightening monetary policy (the increase of the nominal interest rate).

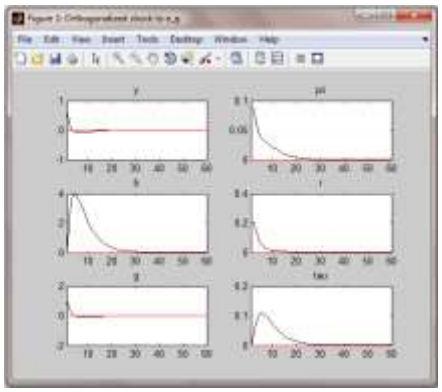

Figure 10. Impulse response function- ε_g

Source: Econometric application Matlab

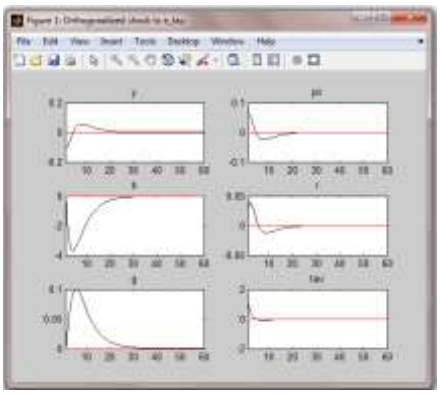

Figure 11. Impulse response function- ε_τ

Source: Econometric application Matlab

Variance Decomposition

As results from the historical variance decomposition graph (figure 12), the stochastic behaviour that influences the variation of GDP from the steady state is determined in the highest proportion by the technologic factor shock, by the initial values of the observed variables, by the governmental expenses shock, followed by the tax shock, world output shock, prices shock and interest rate shock.

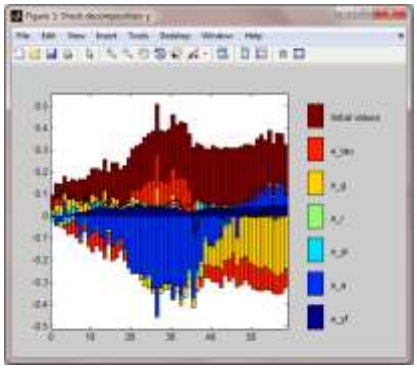

Figure 12. Variance decomposition

Source: Econometric application Matlab

Stability of the System

In terms of system's stability, the system is stable according with the analysis of the eigenvalues of the system. In order to meet the Blanchard-Kahn condition, there must be as many roots larger than one in modulus (the number of non-predetermined variables) as there are forward-looking variables in the model.

According with the output of Dynare tool, from Matlab, in the model there are 3 eigenvalue(s) larger than 1 in modulus for 3 forward-looking variable(s), the rank condition being verified, which means that the Blanchard-Kahn condition is met.

4. Conclusions

To conclude, based on the analysis of the results obtained I have studied the interactions of the fiscal and monetary policy and their role in the stabilization of the economy, putting accent on the analysis of the fiscal policy tools (such as: governmental expenses, income tax rate) and also monetary policy instruments (monetary policy interest rate, characterized through a Taylor rule, based on inflation and output gap target).

The Central Bank modifies the interest rate as a response to the deviation of inflation rate and output from their steady-state point and, respectively, from the natural level of output, taking into consideration also the historical values of the nominal interest rate.

Concomitantly, the fiscal policy initiated by the fiscal authority has two objectives: output and public debt stabilization.

The interdependent analysis of the fiscal and monetary policy is even more important, as a higher level of the public debt is of the nature to block the Central Bank to hold an independent monetary policy, given the fact that an increase of the interest rate would lead to the increase of the public debt.

The current research represents a stage in the analysis of the optimal monetary and fiscal policy mix, for the economy of Romania, given the importance granted by Central Bank to price stability as a target of the optimal monetary policy, target that can only be analyzed as a part of the interactions between the different macroeconomic policies.

To conclude, as a result, an expansionist fiscal policy through the increase of governmental expenses leads to a tightening monetary policy, through the increase of the interest rate and subsequently, to a tightening fiscal policy, through the increase of taxes. A tightening fiscal policy through the increase of taxes leads to the adoption by the Central Bank of a tightening monetary policy (through the increase of the nominal interest rate). Moreover, a tightening monetary policy (through the increase of nominal interest rate) leads to a tightening fiscal policy, on the basis of the decrease of the governmental expenses and the increase of the tax level.

In terms of variance decomposition, the stochastic behaviour that influences the variation of GDP from the steady state is determined in the highest proportion by the technologic factor shock, by the initial values of the observed variables, by the

governmental expenses shock, followed by the tax shock, world output shock, prices shock and interest rate shock. As a further direction for future analysis, I proposed to analyze how the model proposed by the authors Zoltan M. Jakab and Balazs Vilagi (2009) in the article *An estimated DSGE model of the Hungarian economy* responses to the need of Romania's economy, as this is an open-economy extension of the DSGE model presented in Smets & Wouters (2003).

In addition to the model proposed by Smets & Wouters (2003) in terms of openness of the economy, the model assumes that beyond labor and capital an additional imported input is needed for domestic production. On the other hand, another assumption is that part of domestic production is exported. A further complication in this model, missing from that of Smets & Wouters (2003), is the presence of non-Ricardian rule-of-thumb consumers, as in Galí et al. (2007), in order to replicate the empirical co-movement of private and government consumption. Moreover, according with the model there are two types of rule-of-thumb consumers: those who spend her entire labor income for consumption and the second type of rule-of-thumb consumers, pensioners, whose income is independent of labor-hour movements, which decreases consumption volatility. Another interesting subject seems to me the study of macro-prudential policy, as proposed by Dominic Quint and Pau Rabanal (2013), in the article *Monetary and Macroprudential Policy in an Estimated DSGE Model of the Euro Area*, taking into account role of macro-prudential policies included in several studies of the Bank for International Settlements.

The authors proposed the analysis of the optimal mix of monetary and macro-prudential policies in an estimated two-country model of the euro area. They have also have also suggested that the use of macroprudential tools could improve welfare by providing instruments that target large fluctuations in credit markets. The model includes real, nominal and financial frictions, so, both monetary and macro-prudential policy can play a role. The authors have found that the introduction of the macro-prudential rule would help in reducing macroeconomic volatility, improve welfare, and partially substitute for the lack of national monetary policies. The model includes: two countries (a core and a periphery) which share the same currency and monetary policy, two sectors (non-durables and durables, which can be thought of as housing) and two types of agents (savers and borrowers) such that there is a credit market in each country and across countries in the monetary union. The model also includes a financial accelerator mechanism on the household side, such that changes in the balance sheet of borrowers due to house price fluctuations affect the spread between lending and deposit rates. In addition, risk shocks in the housing sector affect conditions in the credit markets and in the broader macro-economy.

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An Assessment of SMEs' Financing by Commercial Banks in Zimbabwe

Stanley Sachikonye[1], **Mabutho Sibanda**[2]

Abstract: Small-to-medium enterprises (SMEs) play a key role in the world economy and contribute significantly to an economy's output, income and employment. This paper seeks to assess the extent to which Zimbabwe's commercial banks finance SMEs. Document analysis and an extensive review of the literature was undertaken to contextualize and draw a framework of analysis for the study. The literature shows that SMEs are of great socio-economic importance in developing countries but access to financial services for SMEs in Zimbabwe remains low. Zimbabwe's economic challenges since 2000 to dollarization in 2009, the informalization of the SME sector, customers' financial illiteracy and lack of training, lack of collateral security for loans, a high non-performing loans ratio, the lack of understanding of SMEs' needs by banks, the inaccessibility of banks and the general lack of financial innovation are some of the major reasons for the low level of SME financing. A harmonised approach to policy suggestions for SMEs, lending institutions, the central bank and government to ensure the viability and growth of the SME sector are required and outlined. The research helps to formalize the SME sector considering its attendant benefits to the relevant players in the economy.

Keywords: SME financing; dollarization; economic development; commercial banks

JEL Classification: G21; G31; G38

1. Introduction

Small-to-medium enterprises (SMEs) are of great socio-economic importance, especially in developing countries, and they remain the mainstay of almost all economies in the world. SMEs contribute in developing economies by generating employment, offering advanced and innovative products and services through entrepreneurship, enhance international trade through diversification (Hussain, Farooq, & Akhtar, 2012), and promote urbanization (Duan, Han, & Yang, 2009). According to the United Nations Industrial Development Organization (UNIDO (2006), SMEs are believed to be especially effective job creators and enjoy a reputation for being sources of income and for providing training opportunities as well as important basic services for disadvantaged people.

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Worldwide, SMEs' long-term growth and competitiveness have been compromised by the chronic and often acute constraints on their access to formal-sector finance, and in developing countries there are also other systemic and institutional problems (Wattanapruttipaisan, 2003b). Access to financial services is vital in developing a vibrant SME sector in any economy. According to the International Finance Corporation (IFC) (2016), in most emerging markets access to financial services for SMEs remains severely constrained and this is the basis for the renewed focus on supporting SMEs worldwide.

In Zimbabwe, the operating environment, since 2000 through to the adoption of the multicurrency system in 2009, has experienced a plethora of challenges. These include deteriorating agricultural sector output; a yawning trade deficit; subdued foreign capital inflows; a heavy external debt burden; acute power shortages; limited fiscal space, low domestic output and de-industrialization; plummeting savings and money supply growth; and unprecedented high non-performing loans ratios in the banking sector. These challenges have resulted in serious liquidity shortages, which erode banks' ability to underwrite business, particularly for SMEs, which are considered risky. The financial services sector in Zimbabwe has a significant role to play in the promotion of the development of SMEs (Dhliwayo, 2014). In the Zimbabwean context, SMEs need more financial and technical support if meaningful economic growth is to be achieved.

2. Objectives of the Study

This study seeks to:

a) Assess the importance of financing of SMEs by commercial banks in Zimbabwe.

b) Assess the extent of financing of SMEs by commercial banks in Zimbabwe.

c) Provide policy recommendations on how to enhance the role of the relevant stakeholders in financing SMEs in Zimbabwe.

3. Review of the Literature

Access to finance is a key constraint to SME growth, and without it many SMEs struggle and fail to grow (World Bank, 2015a). The phenomenon of SME financing difficulties exists in many countries in the world, even in the developed countries with relatively sound financial systems (Jiang, Lin, & Lin, 2014), yet access to financial services is vital in developing a vibrant SME sector in any economy (International Finance Corporation, 2016).

SME finance, like SMEs themselves, is exceptionally diverse and complex and faces unique challenges (Nassr & Wehinger, 2014). The current credit gap for formal SMEs is estimated to be United States dollars (USD) 1.2 trillion; the total credit gap for both formal and informal SMEs is as high as USD 2.6 trillion (World Bank, 2015a). Yet, debt in the form of overdraft facilities is primarily needed by the smaller firm to cover working capital requirements, with intermittent need to finance replacement or expansion investment (Cressy & Olofsson, 1996). SMEs are often unable to provide immovable property required by the banks, and there is a lack of alternative funding, such as venture capital, angel investors, and government and NGO support (Small & Medium Enterprises Association of Zimbabwe, 2015).

The World Bank is increasingly looking to develop more innovative forms of SME financing. (World Bank, 2015a). Some countries use cluster funding, whereby banks identify and group Micro Small and Medium Enterprises (MSMEs) in a locality involved in similar business activities into a cluster and then capacity building and credit programmes are tailored to a cluster's specific needs. Developing countries, such as Bangladesh, have successfully used the cluster model in the development of MSMEs (Mangudya, 2016). Also, Governments in both developed and developing countries have recognized that SMEs struggle to access external financing, which may negatively affect their crucial role in achieving national development goals, thus many governmental initiatives and programmes have been implemented to ensure that SMEs easily access financing (Abdulsaleh & Worthington, 2013). Government official schemes introduced either by government alone or with the support of donor agencies have been seen to have the capability to ease access by SMEs to additional credit (Boocock & Shariff, 2005).

The World Bank reported that Zimbabwe's financial sector has been subject to several distress periods in the last 10 years, including periods of hyperinflation and the national currency collapse, which led to the adoption of a multicurrency system in 2009. This system resulted in financial sector activity shrinking, a scenario that affected the level of SME financing by banks. The same report also revealed that banks in Zimbabwe face several systemic challenges, which include general illiquidity in the market; lack of long-term capital; the high cost of funds, which are only partially mobilized internally and thus still heavily rely on external, often more expensive sources; low capitalization; and a high level of non-performing loans. Credit risk is a significant concern for banks, increasing the reluctance to lend (World Bank, 2015b), with SMEs suffering more from credit rationing than large corporates (Duan, Han, & Yang, 2009). International and regional lines of credit are few and subject to a high risk premium, reflecting the perception of Zimbabwe as high risk due to the existing external debt payment arrears and debt overhang (Malaba, 2014).

In 2012, Zimbabwe joined the Alliance for Financial Inclusion (AFI) network. According to the RBZ (2016), one of the most pronounced trends currently observed among the AFI's member countries is the increasing focus on the development of national financial inclusion strategies. With effect from January 2015, the government initiated the process of bringing the Small and Medium Enterprises Development Corporation (SMEDCO) and Infrastructural Development Bank of Zimbabwe (IDBZ) under the purview of the RBZ. SMEDCO's mandate is to promote the development of MSMEs and cooperatives by providing financial and capacity-building programmes.

In March 2016, in conjunction with the government, RBZ launched the Zimbabwe National Financial Inclusion Strategy (2016-2020), whose objective is to deepen financial intermediation for the marginalized and the unbanked to have access to appropriate financial services during the strategy period of 2016-2020. Unfortunately, the cash shortages that bedevilled the country during this period resulted in farmers withdrawing all their cash once deposited, with very little savings. Nevertheless, in the long term this measure will benefit the country in terms of financial inclusion and financing of SMEs, which includes farmers.

4. Methodology

This study makes an assessment of the level of financing of SMEs in Zimbabwe by commercial banks. An extensive review of the literature was undertaken to contextualize the study and draw some insights from both the theoretical and empirical literature that provided a framework for analysis for the study. Various financial institutions' reports, books and journal articles related to the SME sector were reviewed to get a general understanding of the framework of how and at what level commercial banks finance the SME sector. This study borrowed heavily from previous studies on the SME sector that have been done in Zimbabwe and elsewhere. Specifically, the views, perceptions and information from these reports and research papers were compared and contrasted. Inferences were made and recommendations drawn.

5. Discussion

In Zimbabwe, as at 31 December 2015, there were 19 banking institutions made up of 13 commercial banks, 1 merchant bank, 4 building societies, 1 savings bank, as well as 155 microfinance institutions (MFIs) and 2 development finance institutions (Reserve Bank of Zimbabwe, 2016). In addition, banks have undertaken various strategic initiatives aimed at enhancing support to SMEs such as: negotiating off-shore lines of credit; introducing viability-based lending;

technical training of bank staff in SME financing; providing SME training workshops; and customizing credit policies to suit SMEs' needs (Dhliwayo, 2014).

Banking in Zimbabwe is mainly driven by transactional and savings products, with lending primarily consisting of consumer loans (not production loans).

According to the Labour and Economic Development Research Institute of Zimbabwe (LEDRIZ) (2012), the financial system in Zimbabwe has been excluding people in the informal sector, particularly those in rural areas. Some of the challenges facing SMEs identified by the RBZ included the perceived high risk profile of SMEs and the history of not repaying loans due to an entitlement culture that emanated from receiving free funds from government. However, the problem with accessing loans from MFIs, which are now able to offer loans to SMEs particularly in rural areas, is that they charge exorbitant rates and offer very short tenors, making SME businesses unviable.

Owing to the risky nature of SMEs, over the years, banks have been indirectly supporting SMEs through financing contract growing schemes carried out by large corporations, particularly for tobacco, cotton and sugar (Malaba, 2014). The low level of SME financing in Zimbabwe has been observed to be caused by various shortcomings of SMEs, banks, the regulator and government, as follows.

SME Shortcomings

Several authors and sources have identified the following as shortcomings:

a) Lack of viable business models and operating in struggling or overcrowded industries. SMEs usually operate for short periods, with a high probability of exiting from the market, which scares away lenders. About 85% of SMEs in Zimbabwe fail (60% in the first year and 25% in the first three years) (Mudavanhu, Bindu, Chiguswa, & Muchabaiwa, 2011).

b) Most SMEs are unable to provide collateral security demanded by banks.

c) Lenders are unwilling to fund start-ups or businesses with no track records, unless there is a very strong business case.

d) Many SMEs are owner or family-operated, hence they fail to keep business and personal finances separate. Financial records help demonstrate business performance to both the enterprise owner and lender.

e) High default rates caused by diversion of funds from the intended business purpose characterize many SMEs, hence banks exercise extreme caution when lending to them.

f) Lack of banking records which provide third party confirmation of what accounting records say about a business' earning capacity. This helps when assessing a loan application.

g) Most SMEs lack requisite skills and technology to produce standardized products and/ or services that can compete in the market thus threatening their survival.

h) Many SMEs lack skilled manpower and managerial capacity, resulting in limited ability to sustainably run the enterprises. They also lack good internal controls and accounting systems, relevant licensing and registration, and in the case of medium-sized enterprises governance structures such as advisors, board of directors, diversified shareholding, professional staffing structures and general good business practice.

i) The SME sector is fragmented, characterized by small business enterprises. The absence of vibrant industry associations results in inadequate representation on industry issues.

Lending Institutions Shortcomings

Listed below are aspects of banking that impact negatively on SMEs:

a) The major barriers to banking include the costs of products, which are comparatively high (Finmark Trust, 2014). Banks charge a risk premium on loans to SMEs, resulting in high borrowing costs. Effective lending rates by commercial banks in Zimbabwe ranged from 13-38% per annum in January 2014 (World Bank, 2015b). This compares unfavourably with credit interest on current accounts of 0-5%.

b) The unavailability of bank accounts due to complicated procedures as well as documentation required lead enterprise owners to open personal accounts (Zimbabwe Economic Policy Analysis and Research Unit & Bankers Association of Zimbabwe, 2014).

c) Unfavourable loan terms such as pricing and loan tenors (Zimbabwe Economic Policy Analysis and Research Unit & Bankers Association of Zimbabwe, 2014).

d) Zimbabwe lacks a coordinated financial literacy strategy and no assessment has been made of financial capability levels (World Bank, 2015b).

e) Limited branch network resulting in SMEs remaining unbanked or underbanked.

f) Banks' risk-averse behaviour adopted by banks following the increase in the non-performing loans (NPLs) ratio.

g) Lack of understanding of SME nature, operations and needs by banks hampers their ability to assess the business viability and financing needs of SMEs, thereby making banks fail in offering appropriate banking products to suit SME needs (Dhliwayo, 2014).

h) SME financing is cumbersome and administratively expensive owing to the large number of SMEs and the small loan amounts and transactions that they require, resulting in banks shunning SMEs (Duan, Han, & Yang, 2009).

Central Bank

Here follows some issues that require attention from the central bank in Zimbabwe:

a) Consumers in Zimbabwe have limited recourse rights and there are very limited avenues for third party dispute resolution (World Bank, 2015b).

b) There are no credit reference bureaus in Zimbabwe to provide borrowing history and to track defaulters, thus compounding the risk-averse behaviour of banks.

c) Unemployment, low income levels and unaffordable financial products/services remain key constraints on people becoming financially included. Financial exclusion is particularly high in rural areas possibly due to limited accessibility to banks and formal salaried employment opportunities (Finmark Trust, 2014).

Government Shortcomings

In order to better support SMEs the government should take the following concerns into consideration:

a) Address SME concerns and accord priority to SMEs to enable them contribute to the betterment of the economy (Nyamwanza, Paketh, Mhaka, Makaza, & Moyo, 2015).

b) The perceived country risk of Zimbabwe, worsened by unfavourable indigenization laws requiring locals to own at least 51% of companies, militates against foreign directive investment, which has been very low (Bezuidenhout, 2015).

c) Lack of support in terms of legalizing and regulating SMEs.

d) The heavy-handed approach by the Zimbabwe Revenue Authority (ZIMRA) in collecting tax has pushed SMEs into the informal sector.

6. Policy Suggestions

To SMEs:

a) Present themselves to all stakeholders as professional and viable businesses;

b) Educate themselves on bank requirements and be able to prepare credible project proposals;

c) Put in place good corporate governance structures;

d) Keep records of all business activities and produce financial statements;

e) Bank all the money so that a good track record is built;

f) Move away from cash transactions and adopt plastic;

g) Adopt a saving culture. Use savings to buy fixed property, which can then be used as collateral security to access bank credit;

h) Legally register their companies and ensure all due taxes are paid;

i) Develop guarantee funds that provide collateral for deserving SMEs;

j) Work together as groups and register effective associations. This co-operation helps in knowledge transfer, developing and accessing markets, attracting investors and accessing bank loans.

To Lending Institutions:

a) Understand the dynamics of SMEs;

b) Develop more innovative financing structures and appropriate products for SMEs;

c) Provide advisory services to SMEs;

d) Increase accessibility, and this includes using technology to reduce costs of banking products. Copying successful models such as Mzansi accounts in South Africa and introducing agent banking and leverage mobile phone capabilities could help;

e) Act as agents for groups that pool resources together and use these resources as collateral when they lend to group members;

f) Introduce cluster funding;

g) Introduce leasing as an alternative source of funding, which reduces the need to provide collateral security by SMEs.

To the RBZ:

a) Expedite the launch of the credit reference bureau;

b) Implement systems that protect financial consumers in order to build trust in the financial sector and encourage responsible financial inclusion;

c) Successfully implement the Zimbabwe National Financial Inclusion Strategy;

d) Work with government to provide empowerment credits to foreign-owned banks that finance SMEs up to a certain threshold.

To Government:

a) Put in place policies that bring about an enabling legal, regulatory and operating environment for SMEs to grow and be formalized;

b) Maintain consistent policies so as to attract foreign investors;

c) ZIMRA should accommodate SMEs and give tax holidays or concessions where necessary so as to allow SME growth and development;

d) Work with international lending institutions such as the World Bank, which can help establish offshore lines of credit as well as programmes;

e) Work on improving indigenization laws so as to attract foreign investors;

f) Work closely with SME associations, the donor community and banks to address market failure issues through capacity building of SMEs;

g) Work with local authorities to legalize and regulate SMEs operations through designating specific zones for their activities;

h) Introduce financial education from primary school right up to tertiary level;

i) Capacitate and capitalize SMEDCO so be able to adequately finance SMEs;

j) Ministry of SMEs to work and align with the RBZ and financial institutions in crafting policies and activities that promote SMEs;

k) Capacitate and capitalize the RBZ to implement, track and monitor adopted strategies since these have been blamed for failed strategies.

7. Conclusion

SMEs contribute significantly to developing countries' economies, yet they remain with hugely untapped potential owing to a myriad of challenges, chief among them being lack of finance. Commercial banks in Zimbabwe therefore have a critical role to play in developing SMEs, which can become the basis of the country's economic recovery. There are several kinds of financing options that can be adopted for financing SMEs. There is the need to formalize SMEs as formalized

SMEs benefit the entire economy – the government can earn tax revenue, the SMEs can access formal credit from banks and grow, foreign investors can invest in formal SMEs and banks can lend profitably to SMEs. The success of SMEs is anchored by the active contribution of the four main players, which are the SMEs, financial sector, the central bank and government. It will be constructive for all these main players to integrate and work together in other non-financial interventions, such as training, capacity development, cluster development, tax benefits for funding specific sectors and the general inclusion of SMEs in business activities. Such initiatives will assist SMEs in being innovative, operate efficiently and economically and to reduce the risk of fraud, default and business failure. Such developments will enable banks to profitably lend to SMEs.

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Current Difficulties of Regional Harmonization in Romania

Maria-Ramona Sârbu[1]

Abstract: Given that the current economic disparities have piled up in time, "catching the end" is a lengthy process and requires a significant improvement in the economic, institutional and legislative framework and not least in the concentration of social politics for a more inclusive development. The purpose of this paper lies in analyzing regional disparities and foreign direct investment (FDI) in Romania, in 2013, from the perspective of several structural analyses. Through the structural analysis of foreign direct investment we aim to identify the concentration of foreign capital on the source countries, regional destinations and areas of economic activities.

Keywords: regional disparities; value added; economic activities; FDI structure; foreign capital

JEL Classification: F21; F62

1. Introduction

The purpose of this paper lies in analyzing regional disparities and foreign direct investment in Romania, in 2013, from the perspective of several structural analyses. Through the structural analysis of foreign direct investment we aim to identify the concentration of foreign capital on the source countries, regional destinations and areas of economic activities. Foreign direct investments are one of the representative vectors of actual economic progress and their role tends to become significantly complex in regional economic development through their impact on the evolution of economic and social disparities between regions.

This paper is divided into four sections as it follows:section two provides a comparative analysis regarding regional disparities in the EU and in Romania, the third section of the paper presents the concentration of capital on source countries and regional destinations while the fourth section presents the regional disparities in attracting foreign direct investment followed by the main conclusions.

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2. Comparative Analysis of Regional Disparities in the EU and in Romania

The EU enlargement to 28 member states, tones up the disparities within the Union, context in which, the reduction of such disparities becomes inevitably a lengthy process, which requires the identification of the sources resulting in the differences between the regions in question and enhances from this perspective the role of economic, social and territorial cohesion policy. Under these circumstances, the EU Treaty sets as objective of the cohesion policy, the reduction of economic, social and territorial disparities through a special support administered to less developed regions (European Commission, 2014, p. xviii).

In order to quantify the development of the regions, a relevant set of indicators must be used such as : Gross Domestic Product (GDP) at current market prices by regions, unemployment, labor productivity, the level of income per inhabitant, employment structure, the level of innovation, the degree of development of the infrastructure, the foreign direct investment.

Analyzing from the perspective of economic development, in terms of GDP/inhabitant expressed in Purchasing Power Standard (PPS), in 2013, the highest values are recorded in the most developed European countries such as: UK, Luxembourg, Belgium, Germany, Norway, the Netherlands, France (Table 1). According to statistical data provided by Eurostat, it is noted that in Romania, the most developed region is the capital just as in many EU countries (the UK, Luxembourg, Belgium, Norway).

On the other hand, the regions in EU that record the lowest values of the GDP per inhabitant are the following: Severozapaden in Bulgaria records the lowest value in the UE, 7.700 Euro; Mayotte in France 7.900 Euro; Severen tsentralen and Yuzhen tsentralen in Bulgaria record the same level of 8.600 Euro, followed by the Nord-Est region of Romania with a GDP per capita of 9.000 Euro.

Table 1. Interregional disparities at the E28 level, GDP per capita in 2013

Regions with the highest GDP per capita in PPS	Maximum GDP per capita in PPS	Regions with the lowest GDP per capita in PPS	Minimum GDP per capita in PPS
1.Inner London - West	141.300	1.Severozapaden	7.700
2.Luxembourg	70.500	2.Mayotte	7.900
3.Région de Bruxelles-Capitale / Brussels Hfdst.	56.500	3.Severen tsentralen	8.600
4. Hamburg	54.500	4.Yuzhen tsentralen	8.600
5.Inner London -	52.800	5. Nord-Est	9.000

East			
6.Oslo og Akershus	51.800	6.Severna i yugoiztochna Bulgaria	9.300
7.Groningen	51.400	7.Poranesna jugoslovenska Republika Makedonija	9.500
8.Bratislavský kraj	50.000	8.Severoiztochen	10.100
9.London	48.500	9.Yugoiztochen	10.300
10.Île de France	48.300	10.Sud-Vest Oltenia	10.700

Source: Eurostat statistics

Hereinafter, to have an overview on the development of the regions in Romania, we will present the regional gross domestic product at current market prices by regions (GDP/inhabitant), which gives us important information regarding the degree of economic development in our country. According to the statistical data presented in Table 2, the Nord-Est region has the lowest GDP/inhabitant compared to other regions in Romania, with the highest level registered in 2013 (9.000 Euro). Also, we must notice the separation of the Bucuresti-Ilfov region at the expense of other areas in the country, with a GDP of 33.900 Euros, over the UE28 average (26.700 Euro).

Table 2. Gross domestic product per capita expressed in PPS by Romania regions

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013
Nord-Vest	7.400	8.700	10.300	11.100	10.800	11.200	11.400	12.500	12.500
Centru	7.700	9.100	10.700	11.800	11.500	12.100	12.400	13.800	13.500
Nord-Est	5.200	5.900	6.700	7.600	7.400	7.700	7.800	9.000	9.000
Sud-Est	6.900	7.900	8.700	9.800	9.500	10.300	10.700	12.300	13.000
Sud - Muntenia	6.600	7.700	8.700	10.100	10.100	10.400	10.800	11.000	11.400
Bucuresti - Ilfov	18.600	21.100	25.200	31.800	28.300	30.700	34.300	33.400	33.900
Sud-Vest Oltenia	6.100	7.200	8.200	9.200	9.000	9.600	10.100	10.800	10.700
Vest	8.800	10.500	12.000	13.800	13.200	14.200	14.700	15.400	15.100

Source: Eurostat statistics

Given that the dominant activity in the Nord-Est region and in the Sud-Muntenia region is represented by agriculture and given the close proximity of this regions to Moldova and Ukraine on one side and Danube on the other side, makes the cross

border cooperation difficult, adversely affecting the development of these regions. On the other hand, as the central and western regions are geographically close to the EU, they have a developed infrastructure, human resources are highly skilled and they are more attractive for foreign direct investment, thus positively influencing the economic growth (Albu, 2006, p.70). From this perspective, we believe that these differences between regions, presented above, partially explain the increased regional disparities.

3. The Concentration of Capital on Source Countries and Regional Destinations

In 2013 foreign direct investors in Romania derive both from developed countries and emerging/developing countries. The main four investors in Romania ranked by the percentage held in the FDI stock in 2013 are: the Netherlands who owns 24.4 percent of the FDI, Austria (19.1 percent) Germany (11.2 percent) and France (7.6 percent) (Figure 1).

In contrast, countries that shares significantly smaller in the total volume of FDI in Romania are the following: Italy (4.7 percent), Greece (3.2 percent), Switzerland (3.2 percent), Czech Republic (1.8 percent), Hungary (1.2 percent), Turkey (0.6 percent).

The analysis of data presented in the Figure 1 shows that the largest share of foreign direct investment comes from the states members of the European Union, over 90 percent, causing a certain degree of economic dependency of Romania towards the economic situation in these countries.

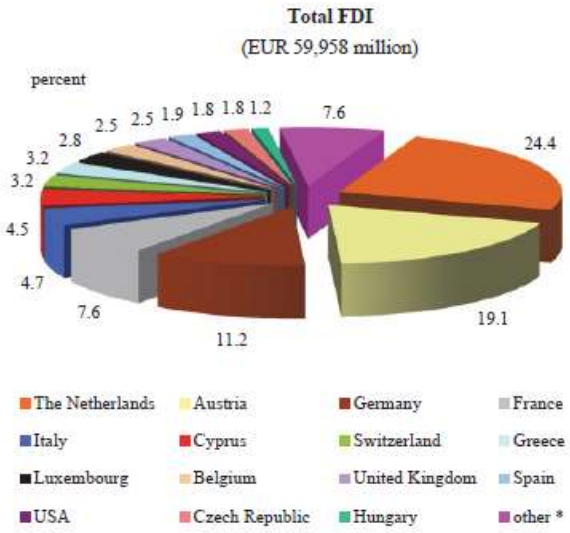

Figure 1. The stock of FDI in Romania in 2013, allocated by source countries

Source: NBR, Foreign Direct Investment in Romania in 2013, p. 23

Also we can notice the fact that the contribution to the financing of FDI in our country is uneven. While a total of four countries the Netherlands, Austria, Germany and France come with a contribution of 62.3 percent to finance FDI, other member states such as Italy, Cyprus, Greece, Luxembourg, Belgium, UK, Spain, Czech Republic, Hungary, Sweden, Ireland, Denmark, Portugal, Norway, Poland and Finland, come with a low share of only 28.3 percent of the total FDI stock. Foreign capital from countries with high economic and financial potential such as the US, Japan, Canada, China registers a low level in Romania's economy, in this context, it is up to the decidents to take measures, strategies and particular policies in order to attract foreign capital in these countries and to enhance cooperation relations with these countries.

From the statistical data on the situation of the top 40 companies by foreign participation in the total subscribed shared capital, in currency equivalent, on 31st December 2013, we find that Germany invested in companies such as : Stabilus Romania SRL (Brasov), Star Assembly SRL (Alba), Star Transmission SRL (Alba) and in other companies. The Netherlands invested in Continental Automotive Systems SRL (Sibiu), Teva Pharmaceuticals SRL (Bucharest), E-Bca Software Holdings SRL (Bucharest), and others. Austria invested in Bardeau Holding Romania SRL (Timis), Hirschmann Romania SRL (Mures), Lamda Imobiliare SRL (Bucharest), Windfarm MV I SRL (Bucharest), and others (NTRO, 2013, p. 21).

Regarding the statistical situation on the hierarchy of counties based on the number of companies and capital expressed in currency in December 2013, highlights the

concentration of foreign capital in industrialized counties. Bucharest is the first in number of companies and also holds a very high number of companies with foreign participation, the number reaching 170 companies and a very large share of the subscribed capital of 86.4%, followed by Ilfov county with a total of 46 companies and a share of the subscribed capital of 1.13 % and Cluj with a total of 28 companies and a shared capital of 1.35% (NTRO, 2013, p. 12).

Statistical reports also show a preference of foreign investors towards the counties economically developed, in proximity to the EU border, near an airport, with a developed transport infrastructure and access to public utilities, with a presence of industrial parks and with a quantity and at the same time quality of qualified human resources.

Down the hierarchy are listed counties such as Alba, Calarasi, Salaj, which are not sufficiently attractive to foreign investors, situation that can be explained against the background of a low socio-economic level, the migration of human resources to other regions and not least an underdeveloped infrastructure.

4. Regional Disparities in Attracting Foreign Direct Investment

From a regional perspective, in 2013, we observe the same uneven distribution of foreign direct investments, which are oriented towards regions that benefit from a developed physical infrastructure such as Bucharest-Ilfov (61.4 percent). In this region we find the most representative investors on 31 December 2013 the British within the pharmaceutical company GlaxoSmithKline (GSK) SRL with a value of the subscribed capital of 66803.9 thousand euro, the Bulgarians within the company Affichage Romania SRL with a subscribed capital of 315663.3 thousand euro, the Polish within banks, Romanian International Bank SA with a value of subscribed capital of 29770.4 thousand euro ((NTRO, 2013, p. 21).

Regarding the following development regions, they perceived a significantly lower flow of FDI: the Centru region who perceived 8.6 percent attracted investors from Germany (Stabilus Romania SRL), the Netherlands (Continental Automotive Systems LLC), France (Rouleau-Guichard Roumanie SRL), Austria (Hirschmann Romania SRL), Israel (Isro House SRL); the Vest region (7.6 percent), capital brought by the Austrians (Bardeau Holding Romania SRL); the Sud-Muntenia region (7.7 percent) capital brought by the Portuguese (Pragosa Romania SRL), the Nord-Vest region who perceived 4.5 percent in FDI flows is preferred by investors from Germany (Kemna Building materials LLC), Sud-Est region (4.2 percent) also preferred by investors from Germany (Crucea Wind Farm SRL) and Italy (SPS SRL); the Sud-Vest Oltenia who perceived only 3.2 percent and the Nord-Est region received the fewest foreign direct investments consisting in 1.685 million EUR (2.8 percent), among the development regions of the country, occupying the last place in the preferences of foreign investors (Table 3).

We believe that this last place occupied by the Nord-Est region can be explained against the background of the low social and economic conditions in the region and also against the lack of strategies in promoting foreign direct investments by local authorities and the absence of a favorable business environment.

Table 3. The stock of FDI in Romania in 2013 by development regions

Economic development region	Value (million)	Share in total FDI (%)
TOTAL Romania, of which:	59.958	100.0
Bucuresti-Ilfov	36.808	61.4
Centru	5.179	8.6
Sud-Muntenia	4.599	7.7
Vest	4.581	7.6
Nord-Vest	2.665	4.5
Sud-Est	2.529	4.2
Sud-Vest Oltenia	1.912	3.2
Nord-Est	1.685	2.8

Source: NBR, Foreign Direct Investment in Romania in 2013, p. 11

Note that the Nord-Est region and the Sud-Vest Oltenia, which attracted the fewest FDI have also recorded the lowest levels of GDP / inhabitant nationwide (Nord-Est (9.000) euro, Sud-Vest Oltenia (10.700 euro)) in 2013, according to Eurostat.

Regarding the distribution of the main economic activities in 2013, we can observe from the graphic the orientation of foreign capital mainly towards manufacturing (31.1 percent), financial intermediation and insurance with 14.2 percent, trade (11.2 percent) and electricity, natural gas and water (11.1 percent), (Figure 2).

The relatively high share of foreign capital towards industry compared to the lower share in the field of services can be explained by: the Romanian tradition in the industrial sector, the specialized labor force, and the relatively low rents and costs regarding the land.

Within the processing industry on the first three positions we can find oil processing, chemicals, rubber and plastic products (18.9 percent); the vehicle manufacturing industry (18.5 percent) and metallurgy with 13.3 percent from the total FDI flows (NBR 2014, p. 20), areas with a relatively high degree of added value.

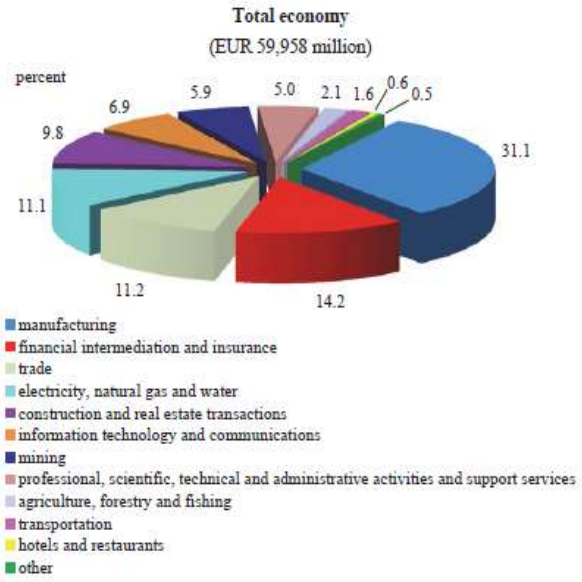

Figure 2. The stock of foreign direct investment in Romania in 2013, according to the main economic activities

Source: NBR, Foreign Direct Investment in Romania in 2013, p. 20

Concerning the net income made by foreign direct investors, according to NBR, in 2013 was recorded a value of 2.839 million, which represented a growth of 1.572 million euro (124 percent) compared to the previous year. The net income consists of earnings form participants in capital and net income from interest. The income from capital participations are profits earned by the FDI companies, worth 5.504 million euro reduced by losses in the amount of 3.554 million euro which the FDI companies have registered, resulting in an amount of 1.950 million euro in 2013. By lowering the revenues of capital participations that were distributed in 2013 to the foreign direct investors (worth 2.287 million euro) we achieve a net loss on the total FDI, worth 337 million euro, calculated according to international methodology for determining reinvested earnings. The net income from interest received by foreign direct investors on loans granted to their companies in Romania, directly or through other non resident companies within the group, has reached a level of 889 million euro. The value is lower compared to 2012, when there was recorded a value worth 936 million euro (NBR, 2013, p. 13).

5. Conclusion

Given that the current economic disparities have piled up in time, "catching the end" is a lengthy process and requires a significant improvement in the economic, institutional and legislative framework and not least in the concentration of social politics for a more inclusive development.

From the analysis of regional disparities, in Romania's case we can observe an intensification of disparities between the development regions in terms of GDP/ inhabitant, the most significant differences are recorded between the Bucuresti-Ilfov region and the other regions.

From the structural analysis of foreign direct investments in Romania, in terms of capital concentration in the source countries, regional destinations and areas of economic activities, resulted that the largest share of foreign direct investment comes from the countries members of the European Union, over 90 percent, which causes a certain degree of economic dependency of Romania towards the economic situation of these countries, context in which, there is a risk to our country's economy through the so-called contagion effect.

From the territorial point of view, in 2013 the Bucuresti-Ilfov region received a significantly higher flow of FDI to the detriment of other regions, holding a weight of 61.4 percent of the total foreign capital that entered our country. In contrast, the Nord-Est and Sud-Vest Oltenia, which attracted the fewest FDI have also recorded the lowest levels of GDP / inhabitant nationwide, for 2013.

Analyzing the concentration of FDI in various fields of the economic activity, we discovered the inclination of foreign investors in Romania towards the so-called traditional industries such as petroleum, chemicals, metallurgy and the activities in the service sector, where the largest share of FDI inclined to financial intermediation and insurance, after which trade appears to have been another favorite sector for foreign investors, followed by electricity, natural gas and water.

Under these circumstances we consider it necessary that the local authorities identify measures and strategies for attracting and directing foreign investment, especially towards those regions economically disadvantaged and towards those economic sectors with high added value.

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Models of Trust and Reputation in eCommerce

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Abstract: In eCommerce it is offered to online clients three types of evaluation: the evaluation of the buyer, the evaluation of the seller or the evaluation of both of them. For most of the cases, the partners of transaction can evaluate each other. In general, evaluations show how satisfied or unsatisfied is a buyer or a seller about the online transaction or his partner after the ending of the process. A small number of models offers a solution for developing an initial set of advisors which can be used for determination of levels of reputation and there are a few models that take into consideration as many social criteria as possible for determination of trust.

Keywords: models of trust; recommendation systems; electronic commerce

JEL Classification: O10; O11

The essential concept of Amazon.com and eBay models is reflected in the average of all the ratings that are taken as an entity, as a value of a reputation. This type of model is called, in the specialty literature, the traditional model of reputation. I will try to outline an image of models of trust.

Marsh's Model

Marsh's researches are the first in which the trust is separated into three different aspects: basic trust, general trust and situational trust. He sees the basic trust as the evaluator agent's provision of trust, based on his entire past experience. The general trust is the general trust on the evaluated agent without any situational clue and, in the same time, the situational trust is the one which depends on the situation and on the context in which the agent is evaluated. The usefulness, the importance of Marsh's model and the factors of knowledge are introduced for determination of situational trust. The elementary equation for the calculation of situational trust's is:

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$Tx(y,\alpha)t=Ux(\alpha)t \ X \ E(Tx(y)t)$ (1)

Where:

X – evaluator agent;

Y - evaluated agent;

α - the situation;

$Ux(\alpha)^t$ - the usefulness earned by x in situation α,

$Yx(\alpha)^t$ - the importance of situation α ,

$E(Tx(y)^t)$ - estimation of basic trust of x to y at time t.

Knowledge as a binary variable, indicates whether the agent evaluator knows the assessed or not, and the importance, as a real number between [0; 1], indicates how important is the situation for the agent evaluator. However, this solution produces a few meaningless behaviors of the agent. For example, the negative usefulness and negative estimation of basic trust produces a positive value to the situational trust. To determine whether the agent evaluator should cooperate with the assessed, the cooperation is based on the perceived risk, perceived competence, estimation of general trust and importance of the situation, as in the following equation:

$$I^x(\alpha)= \frac{perceput\_risc_x(\alpha)}{perceput\_competenta_x(y,\alpha)+E(T_x(y))} \times I_x(\alpha) \quad (2)$$

in which the perceived risk is not formalized. Again, this equation leads to some meaningless behaviors. During the evaluation of the trust's agent, this model takes into consideration only the evaluator agent's experiments and does not take into account interactions and experiments of other agents with evaluator agent.

Esfandiary's and Chandrasekharan's Model

In the model of trust proposed by Esfandiary and Chandrasekharan are proposed two mechanisms of knowledge acquisition. The first mechanism of knowledge acquisition is based on observation and uses Bayesian Networks in this regard. In accomplishing the trust acquisition, the learning is reduced to statistical considerations.

The second mechanism of trust acquisition is based on interaction, the same approach used in Lashkari. There are two main situations of interaction: Explorer protocol where the agents ask other agents about known to evolve the confidence level and the query protocol where the agent asks for advice from other reliable agents. To work with information from witnesses each agent creates a graph in

which the nodes are represented by agents and arcs (a, b) represent the trust's a agent in b agent. The graph does not contain the arcs for which the value of trust is unknown. In such a graph, there exists the possibility of cycles to artificially decrease the level of trust and different paths that provide contradictory values of trust. To resolve this problem, instead of using one single value of trust, the model uses a trust interval determined by the minimum value, i.e. the maximum value of all the roads without cycles which link two agents.

The authors propose a mechanism for trust acquisition using institutions which leads to institutionalized trust. This trust is similar to the concept of reputation ReGret system developed by Sabater and Sierra which will be presented broadly in this work.

YU and Sing Model

The model proposed by Yu and Sing brings in the main plan information stored by an agent about direct interactions, as a set of values that reflects the quality of the interactions (what they call Qos). Using archived information, in line with Dempster-Shafer's theory of track, an agent can calculate the probability that his partner will conduct a service. There are two types of information that can be derived from witnesses interrogated about a target agent. If the target agent is one of his acquaintances, he will provide information about him, if not, he will return the target agent references. References generate valid information that are taken into account if they are close to the limit depth of chain of references. The set of reference chains generated due to a query is a TrustNet.

Afras Model

The main feature of this model designed by Carbo consists in using of fuzzy sets to represent the values of reputation. Once a new fuzzy set which shows the degree of satisfaction of the last interaction with a nominated partner is calculated, the old value and the new value of the reputation of satisfaction are gathered using an aggregation based on weights. This weights of aggregation are calculated from a single value called remembrance or memory. This factor allows the agent to give more importance to the last interaction or to the old value of reputation. If the satisfaction of the last interaction and the reputation attributed to the partner are similar, the significance of the previous experiences is increased. The notion of reliability of the value of reputation is modeled by fuzzy sets. A broad fuzzy set for the value of reputation represents a high degree of uncertainty, while a narrow fuzzy set involves a value of trust. Recommendations from other agents are collected with direct experiences. The weight given to each factor (the old value of reputation and the new opinion) depends on the reputation she has. Recommendations from a

person with a good reputation have the same degree of trust as a direct experience, and the opinion of an agent with a bad reputation is not taken into account. To calculate the reputation of those who recommend, the agent compares the recommendation received with the real behavior of the one who recommends after interaction and increases or decreases accordingly his reputation.

Carter's Model

The main idea of the reputation model presented by Carter is that an agent's reputation is based on the degree of accomplishment of the roles assigned to him by the company. If the company believes that they have fulfilled the roles then they are rewarded with a positive reputation, otherwise they are punished with a negative reputation. Every society has its set of roles. So the reputation attributed as a result of these types of roles makes sense only in the context of that particular company. According to the authors, it is impossible to generalize the computation's reputation. Users should be encouraged to maintain a good reputation to promote the longevity of the system. The degree of satisfaction of this role is measured according to the level of the user's reputation.

Given that reputation is computed as a weighted sum of the degree of satisfaction of each role, the values are totally dependent on the specific company. The amount of reputation for each agent is calculated by a centralized mechanism which monitors the system. Therefore, the value of each user's reputation is a global measure shared by all observers.

Castelfranchi's and Falcone's Model

The model proposed by Castelfranchi and Falcone is a clear example of the cognitive model of trust. Their model is the close relationship between trust and delegation. They say that trust is the mental background of delegation. In other words, the decision taken by agent x to choose a task for agent y is based on a specific service of beliefs and goals, and this mental state is what we call trust.

- To create a mental state of trust, the agent should have the following basic beliefs:

Conviction of competence.

- The agent must be convinced that z may even fulfill the task.

Conviction of dependency.

- The agent thinks y must carry out the task or that it is better to rely on y to do it.

Conviction of provision.

- Agent not only believes that y must carry out the task, but y will do it 100%. If the agent is intentional, the belief provision should be articulated and advocated by another two beliefs:

Conviction of desire

- The agent believes that y has been decided and plans to make the action c which allows achieving g goal.

Conviction of persistency

- The agent y is stable in his intent to do action c.

Conviction of competence and conviction of dependency form what they call basic trust, and with conviction of provision form reliability. Supported and involved by previous convictions, there is a new conviction, the conviction of fulfillment

Abdul-Rahman's And Haile's Model

Researchers Abdul-Rahman and Hailes suggest a model of trust rooted in social trust from reality, based on the mechanism of spread by mouth.

These authors divide trust into 3 types:

- Interpersonal trust which is context-specific and depends on the direct trust that an agent has in another.
- Impersonal Trust which is based on structures and is known as trust based institutions.
- Dispositional trust, which is the basic trust in the trust model Marsh.

In fact only interpersonal trust is the shaped, forming four categories of levels of trust such as: vt (very reliable), t (trusted), u (not trustworthy) and vu (very unreliable). For each evaluated agent and each context, in a set Q, the evaluator agent maintains the pair of numbers corresponding to the experience of each category of trust.

The basic value of trust is not used directly for the formation of evaluated agent's value of trust, instead, it is used to calculate the distance semantics used to adjust the agent's testimony that recommended it.

Sen's and Sajja's Model

Sen and Sajja propose a model of trust based on reputation that uses a minimal number of witnesses and consider information from direct and seen interaction. An agent needs to require evaluation of witnesses in order to guarantee the proper choice of provider. The following inequality is used to calculate the minimum number of witnesses q:

$$\sum_{i=\max([\frac{q}{2}],[\frac{q}{2}]+1)}^{p} \frac{C_{N-1}^{i} * C_{l}^{q-1}}{C_{N}^{q}} \geq g, \quad (3)$$

Where:

N-population of buyers agents,

P-population of sellers agents

l-false number that is less than or equal to N/2,

g-represents the probable proximity.

Agencies use learning by strengthening to know how to assess a provider's reputation through direct interaction with him or by observing the interactions of other agents and provider. Only direct interaction provides a presumption of reality. Learning by strengthening mechanism is selected for updating the value of reputation. Due to the noise from the information, the rule used to update the value of reputation when a new direct interaction appears, has a bigger effect than the rule used to update the value when there is a new observation. The value of reputation ranges between 0 and 1. A value bigger than 0.5 means a good provider and value less than 0.5 means a bad provider. Agents may interrogate other agents on the performance of a particular partner. The answer is always a Boolean value that indicates whether the partner is good or not. In this model, the subgroup of the agents who will be query are randomly selected from the group of potential witnesses, though, the author says that it is easier to add a quick selection whose process is based on a mechanism of trust.

Since the objective of this model was to study ways in which agents use a person's reputation for picking a partner among many partners, agents use only information from witnesses to get a final value of reputation.

Huang's Model

Huang proposes a model for training trusted agents in a trade from peer to peer. He defines his model starting from the next faith: trust is a psychological condition which includes:

Waiting-the one who has trust expects a particular behavior on the one in who he trusts (such as providing valid information, carrying out effective cooperative actions).

Faith-the one who has trust believes that waiting is real, based on proof of competence from the one who he trusts and his goodwill.

Willingness to be vulnerable-the one who has trust is ready to be vulnerable to the

faith in a specific context in which the information is used or the measures are applied.

In the model, the value of the evaluated agent's trust is determined by the memory of assessor agent and represents a beneficial value of transactions carried out by the evaluated agent. An unclear process is used for forming agent's trust based on dates of entry of the corresponding testimony, however, builds a logical theory of trust in the form of the ontology that gives formal and explicit clarification for the semantics of trust.

Regret Model

ReGret is a modular system of trust based on reputation-oriented e-commerce environments in which social relations between people play an important role. The system takes into account three different information sources: direct experiences, information from third-party agents and information of social structure.

Direct trust module deals with direct experiences and with their contribution to trust in third party agents. Together with reputation model forms the basis for the calculation of the trust. Reputation model consists in three specialized types of reputation depend on what information source is used to calculate:

- The reputation of the witness calculated from information received from witnesses.
- Proximity's reputation calculated using the information extracted from the social relations between partners.
- System's reputation calculated from the amount of reputation based on roles and properties.

The system incorporates a system of credibility that allows the agent to measure the credibility of witnesses and their information, which uses to calculate their reputation. Modular system approach enables the agent to decide on which one they want to use.

The last element of ReGret is the ontological structure based on the grounds that the trust and reputation are not abstract, alone concepts, but rather concepts with more sides.

Conclusion

Most models of trust and reputation are not made to deal with a large amount of missing data (other buyers choose not to offer any feedback). In addition, if there is not a suitable mechanism, in fact they divide agents to endure the lack of information and to provide information for those who don't do that. An agent prefers not to import and choose a free strategy of coercion. Ontological structure provides necessary information to combine the values of trust and reputation-related to simple aspects to compute values which are associated with more complex attributes. The authors of ReGret believe that each person can have a different ontological structure to combine the values of trust and reputation, and a different way of giving weight to these values when they are combined. Trust in faith and confidence in performance are identified in Huang's model. Transitivity's trust is formally proven.

In Sen's and Sajja's model direct interaction of the evaluator is not integrated into the evaluation of testimony evaluated to obtain the value of evaluated reputation.

But the trust and reputation can be explored for many years by researchers in order to define patterns to represent as realistic as possible the electronic market.

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