The trend of the Romanian migration flow explained by means of statistical models

Daniela Gabriela Cozma[*], Margareta Bocancia[**]

Abstract

In the period after 1990, due to the economic crisis and the isolation imposed by the communist regime, Romania was one of the emigration source countries, the main purpose of emigration being to work abroad. Moreover, Romania's accession to the European Union offered Romanians the opportunity to exploit the opportunity to emigrate in a "liberalized" manner without social-political constraints. Over time, it has been observed that there is a relationship of interdependence between economic development, political stability, social factors and the migration phenomenon. Starting from this context, the purpose of the proposed research was to study the volume of the Romanian emigration flow, according to the country of destination between 1990-2017, and the way in which GDP influenced this emigration flow in the period 2008-2016. The hypothesis from which we started was that only certain countries were priority targets of the Romanian emigration flow. In our scientific approach, we used the EUROSTAT and TEMPO databases, constructing a multiple linear regression model in the first part of the study, and a model of main component analysis (ACP) in the second part, in which we used statistical distances for the assessment of outlier values, insisting on the difference between Mahalanobis distance and Euclidean distance. The result of our research confirmed the size of the Romanian immigration volume, not for all the countries considered in the model, but only for a single destination - Spain, which was the main "target" of emigration of Romanian citizens, confirmed by the two distinct models.

Keywords: Romanian migration flow, emigration countries, statistical model.

*Daniela Gabriela Cozma is Phd student at Doctoral School of Economics and Business Administration, Alexandru Ioan Cuza University, Iasi, Romania; e-mail: dana17miruna@yahoo.com

**Margareta Bocancia is Phd student at Doctoral School of Economics and Business Administration, Alexandru Ioan Cuza University, Iasi, Romania; e-mail: mbocancia@yahoo.com

Introduction

The migration phenomenon has an impact on the European Union as a whole, but also on the Member States. Against this backdrop, policies have emerged that address the challenges that migration has confronted lately, policies related to integration into the labour market, respect for migrants' rights, and the fight against illegal migration.

Migration is a phenomenon that has positive effects on the economies of the countries involved, mentioning here:

- coverage with specialized workforce in recipient countries;
- coverage of money needs in the countries from where they left;
- a demographic balance that has emerged as a result of an aging population, especially of economically developed countries.

The phenomenon of Romanian migration started after 1990, the preference for the destination countries changing in relation to the migratory regime in which this phenomenon took place.

We can speak, in this context, about a staged Romanian migration phenomenon:

- Stage 1990-1995, considered by researchers in the field as "ethnic migration", consisted of the departure of Saxons / Swabians in Germany and of a smaller number of ethnic Romanians of Hungarian origin in Hungary;
- Stage 1995-2001 (folded on the internal crisis of the Romanian economy from 1997-1999) highlighted the departure of Romanians in Europe to seek employment for their qualifications;
- The opening stage of the Schengen area, when migration suddenly increases, establishing a hierarchy of immigration preferences towards Italy, Spain, partly Portugal;
- Romania's entry into the European Union (2007) marks the exponential growth of Romanian migration.

The purpose of this research is to study the Romanian migration flow according to the country of destination in the period 1990-2017 and the way in which the GDP in the period 2008-2016 influenced this flow. Starting from the hypothesis that only some countries were the "priority" targets of the Romanian migration flow, we confirm the reality of the Romanian migration volume, but not for all the countries considered in the statistical model, but only for a single destination - Spain.

1. Literature Review

Classical migration theories of the sixteenth and eighteenth centuries were dominated by mercantilism, which claimed that national economic policy was aimed at accumulating monetary reserves through a positive balance of trade, especially of finished products, and stimulated emigration towards colonies.
Adam Smith (1723-1790) investigated migration, claiming the need to break down barriers between states, population and capital movements (Smith, 1785). The first to state migration laws was Ernst Georg Ravenstein (1834-1913) who quoted 7 migration laws and stressed that migration is driven by the "push / pull" process, the unfavourable conditions in a region potentiating migratory flows to favourable conditions in another region. Starting from Ravenstein's ideas, most researchers have delivered migration theories that are derivations of his theories. John Hicks, winner of the Nobel Prize in 1932, said that "the differences in net economic benefits, mainly wage differences, are the main causes of migration" (translation pp.76). By his statement, Hicks laid the foundations for neoclassical migration theory paving the way for modern analysis of the migration phenomenon. Neoclassical theories of the 1970s laid the foundations for international migration theory (Massey et al., 1993), considering the individual as the cause of the migration phenomenon. Neoclassical economic theory, developed by Larry A. Sjaastad (1934-2012), articulates the relationship between the migrant and human capital investment, with reference to the costs and benefits of migration (Sjaastad, 1962). Sociologist Andrè Gunder Frank (1929-2005), developing the theory of dependency, states that the global economy is not equal for all countries because the poor countries are subordinated to the rich ones, the former being attributed the production of raw materials with low added value, while industrial production, with high-added value belongs to rich countries. While in neoclassical theory migration reduces real wage disparities between regions, in Keynesian theory, migration reduces unemployment disparities. (Jennissen, 2007, pp. 411-436).
Everet Lee (1917-2007) has developed hypotheses about the volume of migration, defining migration, according to migrants' characteristics, as a permanent / semi-permanent change of residence (Lee, 1966, pp. 49). In the last 10-15 years, international entities, OECD, IOM, and IMF, have become interested in the volume and effects of migration on development. For many researchers, the analysis of the relationship between migration and development has resulted in studies that explain the link between remittances and the economic growth of migrants' countries of origin. (Carling, 2014) The interest in studying the phenomenon of Romanian migration has increased along with the magnitude of the migration captured by the official statistics. Investigations were carried out on the Romanian migration phenomenon, including:

- 2007 (Metro Media Transilvania) study on social, working and living conditions of Romanians in Italy (Dancu coordinator);

- 2008 (CURS Bucharest) captures the migration phenomenon in Spain and Italy (coord. Abraham);
- 2010 (Italian Foundation Caritas) studies Romanian migration from Italy;
- 2011 (Soros Foundation) captures the migration of Romanian medical staff.

2. Research methodology

In our scientific approach, we used the EUROSTAT and TEMPO databases, building, in the first part of the study, a model of analysis of the main components (PCA), by destination countries of Romanian migrants, between 1990-2017, and in the second part, researching by multiple linear regression, the influence of GDP in 5 countries identified as priority destinations of Romanian emigration in the period 2008-2016. In the multiple linear regression model we considered as dependent variable the number of emigrants in Romania, and as independent variables (predictors) the GDP values in Spain, France, Italy, Germany and the United Kingdom. We replaced the Euclidean distance with the Mahalanobis distance to reduce the exaggerated influence of large-scale components.

2.1. Researching the volume of the emigration flow from Romania in the period 1990-2017, depending on the country of destination

By using the public data on the total number of definitive emigrants from Romania[1], a PCA[2] model is proposed, by country of destination of the Romanian emigrants, in two working variants:

- for the period 1991-2006 inclusively;
- for the period 2007-2017 inclusively.

2.1.a) Research of the volume of the emigration flow from Romania during 1991-2006

The proposed model opens with Table 1 data, which show the average values and the standard deviation values for the following 9 distinct emigration destinations, of which 7 European (Israel is assimilated as European destination) and 2 extra-European (Canada and the United States of America) .
1) Austria, 2) Canada, 3) France, 4) Germany, 5) Greece, 6) Israel, 7) Italy, 8)Spain (dates only between 2001 and 2006), 9) USA.

[1]Source INS-TEMPO_POP_309D, accessed on March 21, 2019

[2]C.Pintilescu "Analiza statistica multivariata" (Multi-varied Statistical Analysis), Ed, Universitatii "Al.I.Cuza" Iasi, 2007, p.57-Principal Component Analysis

Table 1. Descriptive Statistics for the emigration during 1991-2006

Country	Mean	Std. Deviation	Analysis N
Austria	379.83	148.497	6
Canada	1614.00	447.408	6
France	390.33	106.139	6
Germany	2018.33	844.812	6
Greece	95.67	28.877	6
Israel	137.67	77.415	6
Italy	2253.83	797.818	6
Spain	267.50	183.719	6
USA	1825.67	265.958	6

Source: own representation

The highest average number of migrants in Romania registered for the destinations Germany, Italy and the US, the last despite the restrictive visa regime, which still exists today. PCA is considered valid, according to table 2. Extraction Method: Principal Component Analysis.

Table 2. Correlation Matrix[a,b]

		Austria	Canada	France	Germany	Greece	Israel	Italy	Spain	USA
Correlation	Austria	1.000	-.563	.407	.985	.533	-.689	.922	-.483	.356
	Canada	-.563	1.000	.491	-.536	.216	.932	-.368	.985	.204
	France	.407	.491	1.000	.460	.813	.331	.606	.559	.755
	Germany	.985	-.536	.460	1.000	.518	-.624	.935	-.462	.498
	Greece	.533	.216	.813	.518	1.000	-.016	.759	.345	.389
	Israel	-.689	.932	.331	-.624	-.016	1.000	-.487	.908	.237
	Italy	.922	-.368	.606	.935	.759	-.487	1.000	-.251	.508
	Spain	-.483	.985	.559	-.462	.345	.908	-.251	1.000	.214
	USA	.356	.204	.755	.498	.389	.237	.508	.214	1.000

a. Determinant = .000; b. This matrix is not positive definite
Source: own representation

There is a fairly good correlation between the 9 variables, with the stating of the low number of data in the case of Spain. Values to North American destinations are visibly less correlated to values to European destinations.

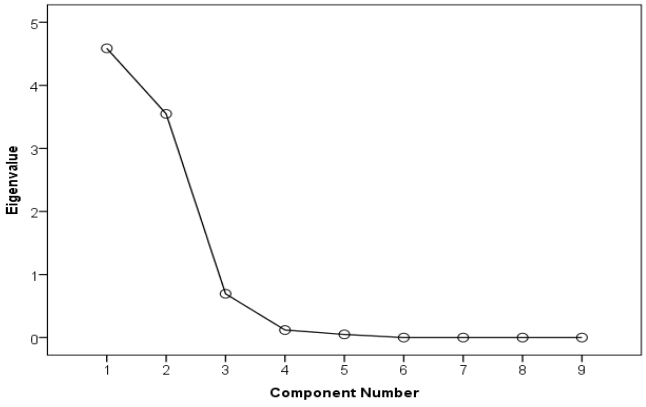
Table 3. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.588	50.975	50.975	4.588	50.975	50.975
2	3.548	39.424	90.399	3.548	39.424	90.399
3	.695	7.720	98.120			
4	.120	1.330	99.450			
5	.049	.550	100.000			
6	1.003E-013	1.029E-013	100.000			
7	1.002E-013	1.025E-013	100.000			
8	-1.000E-013	-1.005E-013	100.000			
9	-1.001E-013	-1.007E-013	100.000			

Extraction Method: Principal Component Analysis.
Source: own representation

This arrangement of the factors, with the first two having their own values above 1, is also shown in Figure 1.

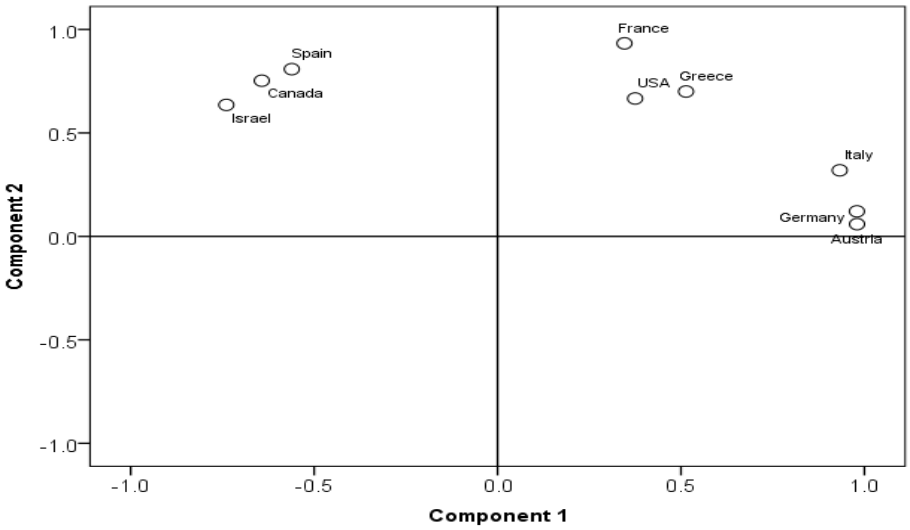
Figure 1. Diagram corresponding to the PCA model regarding the emigration data from Romania on 9 countries of destination in 1991-2006.



Source: own representation

Two factors having "eigenvalue" over 1 and a third factor the own value of which is close to 1 are obtained, so that, in total, these first 3 extracted factors explain 98.12% of the system variance, that is, practically explains the totality of it.

Figure 2. Diagram of the distribution of the old variables (destination countries) corresponding to the first two factors extracted in the PCA model regarding the emigration data from Romania to 9 destination countries during 1991-2006.



Source: own representation

The last diagram confirms the separation of the destination countries for the period 1991-2006 into three categories: a) Spain (unfortunately with incomplete data), Canada, Israel, thus containing two non-European destinations; b) France, Greece, and the USA; c) Italy, Germany, Austria.
The variables in group (a) are poorly correlated with F2 (factor 2) and strongly correlated with F1 (factor 1).
The variables in group (a) are strongly correlated with F2 (factor 2) and poorly correlated with F1 (factor 1).

2.1 b). Researching the volume of the emigration flow from Romania during 2007-2017

The working procedure in 2.1 (a) is repeated.
The data from tables 4 and 5 and Figure 3 and 4 are obtained.

Table 4. Correlation Matrix[a]

		Austria	Canada	France	Germany	Greece	Israel	Italy	Spain	USA
Correlation	Austria	1.000	-.554	.937	.787	.819	.340	.910	.920	-.272
	Canada	-.554	1.000	-.322	-.156	-.297	-.380	-.391	-.671	.827
	France	.937	-.322	1.000	.871	.784	.208	.916	.872	-.127
	Germany	.787	-.156	.871	1.000	.554	-.214	.907	.707	-.104
	Greece	.819	-.297	.784	.554	1.000	.305	.600	.609	.098
	Israel	.340	-.380	.208	-.214	.305	1.000	.161	.399	-.141
	Italy	.910	-.391	.916	.907	.600	.161	1.000	.899	-.264
	Spain	.920	-.671	.872	.707	.609	.399	.899	1.000	-.538
	USA	-.272	.827	-.127	-.104	.098	-.141	-.264	-.538	1.000
Sig. (1-tailed)	Austria		.038	.000	.002	.001	.153	.000	.000	.210
	Canada	.038		.167	.324	.187	.124	.117	.012	.001
	France	.000	.167		.000	.002	.270	.000	.000	.355
	Germany	.002	.324	.000		.039	.264	.000	.008	.381
	Greece	.001	.187	.002	.039		.181	.026	.023	.388
	Israel	.153	.124	.270	.264	.181		.319	.112	.339
	Italy	.000	.117	.000	.000	.026	.319		.000	.216
	Spain	.000	.012	.000	.008	.023	.112	.000		.044
	USA	.210	.001	.355	.381	.388	.339	.216	.044	

a. Determinant = 1.050E-009
Source: own representation

Compared to the data in Table 2, there is a much more appropriate correlation to factorization, an aspect revealed by the value of the determinant associated with the correlation matrix between the 9 variables. The values of emigration to North American and Israeli destinations are reversely correlated to the values to European destinations, namely there is a slightly different situation from that of the 1991-2006 period in terms of PCA model adequacy.

Next, the data in Table 5 are presented:

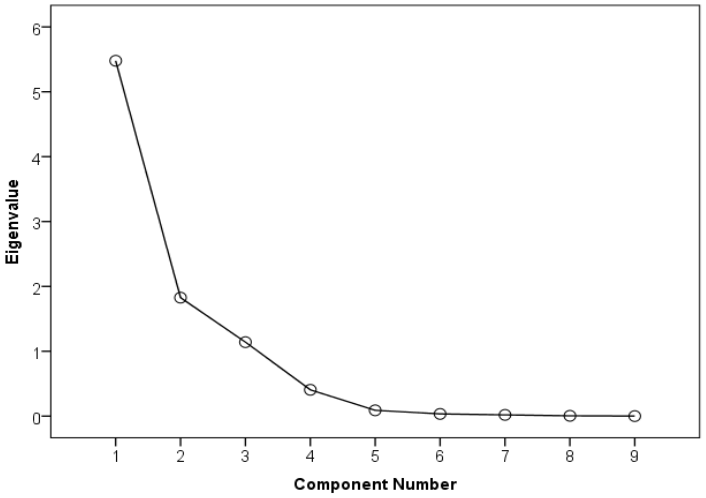
Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.478	60.872	60.872	5.478	60.872	60.872
2	1.826	20.293	81.165	1.826	20.293	81.165
3	1.141	12.674	93.839			
4	.406	4.512	98.351			
5	.090	.995	99.346			
6	.034	.382	99.728			
7	.019	.210	99.938			
8	.005	.053	99.991			
9	.001	.009	100.000			

Extraction Method: Principal Component Analysis.
Source: own representation

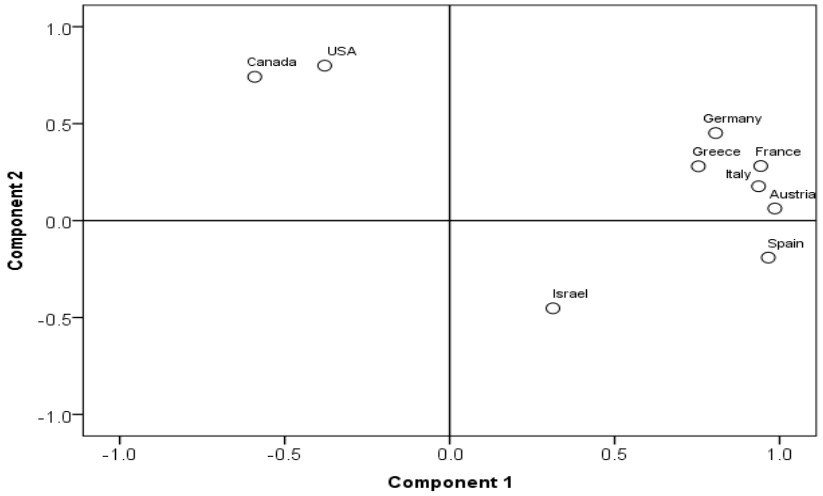
Based on the data in Table 5, the discussion is limited to the first two factors. This arrangement of the factors, with the first two having their own values above 1, is also shown in Figure 3.

Figure 3. The diagram corresponding to the PCA model regarding the migration data from Romania on 9 destination countries between 2007-2017



Three factors with "eigenvalue" above 1 are obtained, so that these three first factors extracted explain, in total, 93.83% of the system's variance, that is, slightly less than in case of the similar graph for the period 1991-2006.
This is shown in Figure 4.

Figure 4. Diagram of the distribution of the old variables (destination countries) corresponding to the first two factors extracted in the PCA model regarding the emigration data from Romania on 9 destination countries during 2007-2017.



Source: own representation

The last diagram confirms the separation of destination countries for the period 2007-2017 in 3 categories: a) Canada, USA, Israel, thus containing 3 extra-European destinations; (b) Germany, France, Greece, Italy, Austria; (c) Spain.
Spain becomes the main destination for the emigration of Romanian citizens.

2.2. The influence of Gross Domestic Product (GDP) per capita in the Western European countries on the number of emigrants from Romania in the EU countries during the period 2008-2016

A multiple linear regression model is suggested for highlighting the GDP influence of the 5 countries considered as priority destinations for Romanian emigration (France, Germany, Italy, Spain and the UK) for 2008-2016[3].

[3] Source: Eurostat

For the period considered, the averages and standard deviations for the number of immigrants in Romania ("Ro_emi") namely GDP in the 5 countries mentioned (Spain, France, Italy, Germany and UK) are shown in Table 6.

Table 6. Descriptive Statistics

	Mean	Std. Deviation	N
Ro_emi	205562.89	44242.523	9
Spain	23011.11	797.566	9
France	31177.78	446.592	9
Italy	26311.11	904.771	9
Germany	33222.22	1261.723	9
United_Kingdom	30422.22	902.466	9

Source: own representation

The five predictors are GDP in Spain, France, Italy, Germany and the UK, and the dependent variable is represented by the number of emigrants in Romania.
The Euclidean distance approach is made by defining the centre of a class (or class centre) usually as punctual, having as components the arithmetic means of the corresponding components in the class points. Distances are estimated similarly to those in classical mechanics, between 2 points:
1) the one corresponding to the observation, starting from the fact that if there are *m* random variables real numbers that form a class, their values determine a point in the space R^m, and
2) a central point, also called the centre of the class.

Distances can be calculated as Euclidean distances, but using this type of distance does not reflect the properties of the variable distribution. Variables measured on different scales of different size orders can greatly affect Euclidean distances. Components with high variability should contribute with lower weights than those with low variability.
To reduce these inconveniences, new distances were defined, the most used being the Mahalanobis distance, for which, if Σ is the covariance matrix of the *m* variables, that is, $\Sigma = \text{cov}(\mathbf{x})=\exp[(\mathbf{x}-\exp(\mathbf{x}))(\mathbf{x}-\exp(\mathbf{x}))']$ then the Mahalanobis

distance[4] between points $x = (x_1, \ldots, x_m)'$ and $y = (y_1, \ldots, y_m)'$, is defined by $d_\Sigma(x,y) = (x-y)'\Sigma^{-1}(x-y)$.

This increases the probability of detection of abnormal data (outliers), considered to be those observations that are abnormal in relation to their probability distribution, thus having an intrinsically lower probability of occurrence.

A normal multivariate distribution of dimension d is defined by the probability density, the expression of which is given below:

$$f(x) = \frac{1}{(2\pi)^{d/2}} \frac{1}{|\Sigma|^{1/2}} \exp(-1/2(x-\mu)'\Sigma^{-1}(x-\mu)),$$

where Σ is the convariance matrix and $\frac{1}{|\Sigma|^{1/2}}$ is the Jacobian of transformation.

The exponent in the relationship above is the Mahalanobis distance[5].

Table 7 shows the values of the Mahalanobis distance in the present case.

Table 7. Mahalanobis Distances for Detecting Possible Extreme Values

Year	Mahalanobis distance
2008	3.03251
2009	0.13120
2010	0.05609
2011	0.01941
2012	1.03426
2013	1.94081
2014	0.79495
2015	0.01242
2016	0.97836

Source: own representation

[4] R.C.Mahalanobis, "On the generalised distance in statistics", *Proceeding of the National Institute of Statistics of India*, 2 (1), 49-55, 1936

[5] M.Popa "Statistici multivariate aplicate in psihologie" (Multivaried statistics applied in psychology), Polirom Publishing House, Iasi, 2010, p.153

The Mahalanobis distance does not exist, except for 2008, in any of the years considered in the model as extreme values that reach a critical threshold of this index.

Existing correlations, which can identify the risk of multicollinearity,

are shown in Table 8.

Table 8. Corelations

		Ro_emi	Spain	France	Italy	Germany	United_Kingdom
Pearson Correlation	Ro_emi	1.000	.878	-.189	.842	-.489	-.065
	Spain	.878	1.000	.078	.746	-.195	.187
	France	-.189	.078	1.000	-.244	.939	.901
	Italy	.842	.746	-.244	1.000	-.525	-.329
	Germany	-.489	-.195	.939	-.525	1.000	.850
	United_Kingdom	-.065	.187	.901	-.329	.850	1.000
Sig. (1-tailed)	Ro_emi	.	.001	.313	.002	.091	.434
	Spain	.001	.	.421	.010	.307	.315
	France	.313	.421	.	.264	.000	.000
	Italy	.002	.010	.264	.	.073	.193
	Germany	.091	.307	.000	.073	.	.002
	United_Kingdom	.434	.315	.000	.193	.002	.
N	Ro_emi	9	9	9	9	9	9
	Spain	9	9	9	9	9	9
	France	9	9	9	9	9	9
	Italy	9	9	9	9	9	9
	Germany	9	9	9	9	9	9
	United_Kingdom	9	9	9	9	9	9

Source: own representation

Table 9. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.878[a]	.771	.738	22644.893	.835

a. Predictors: (Constant), Spain; b. Dependent Variable: Ro_emi
Source: own representation

Spain is the preferred destination for emigration, not just because of the GDP of the country of destination but also of other variables of interest that are more difficult to quantify, such as the pre-existence of a high number of compatriots who have already emigrated and, between whom the linguistic barrier no longer exists, recent immigrants' hope to achieve social inclusion in the environment. For the priority as massive migration destination, given strictly by GDP pleads the data in the tables 9 and 10.
The Durbin-Watson condition, shown in Table 4, shows compliance with the error-independence condition (values below 1). The value R^2 would allow the effect[6] size to be calculated, f = 1,093, but an over-estimated and unrealistic value is obtained in the given context[7], given the following two aspects:
1) the influence of a single predictor (GDP Spain) instead of the common influence of several predictors of the 5 considered;
2) assimilating the GDP influence in a simplified way as the only way to predict / anticipate a complex behaviour.
Table 10 confirms the previous observation, that of the predominance of the influence of a single predictor of those considered.

[6] M.Popa "Statistici multivariate aplicate in psihologie" (Multivaried statistics applied in psychology), Polirom Publishing House, Iasi, 2010, p.157

[7] J.Cohen "Statistical Power Analysis for the behavioral sciences" Erlbaum, Hillsdale, 1988

Table 10. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12069668396.7	1	12069668396.6	23.537	.002[b]
	Residual	3589538196.2	7	512791170.888		
	Total	15659206592.8	8			

a. Dependent Variable: Ro_emi; b. Predictors: (Constant), Spain
Source: own representation

Therefore, the multiple linear regression model has become a simplified model, that of a simple linear regression.

Conclusions

The objective of our research was to study the volume of the Romanian migration flows, depending on the destination country, between 1990-2017 and the way in which the GDP in the period 2008-2016 influenced this emigration flow.
The hypothesis from which we started was that only certain countries were priority targets of the Romanian migration flow. Of a group of five European countries identified as priority targets of the migratory flow in Romania, only in case of two of them (Italy and Spain) the multiple linear regression model indicated a significant correlation. The multiple linear regression model regarding GDP influence in five countries (GDP considered as a predictor of the number of immigrants) confirms the reality of the migration volume, but not for all states considered in the model, but only for a single destination (Spain), the model becoming that of a simple linear regression.

The result of our research confirmed the reality of the Romanian migration volume for only one destination - Spain, which was the main "emigration target" for Romanian citizens.
In this context, we can pave the way for a new study that would investigate how Spanish legislation has succeeded in developing social security systems, in integrating socio-economically Romanian migrants, and in harmonizing individual and collective relationships. Looking in the opposite direction, given the acute labour force crisis in the fields where they work abroad, one can study the way in which Romania can stimulate the repatriation of migrants.

References

Bleahu, A. (2004), *Romanian migration to Spain: motivation, networks and strategies*, New patterns of labour migration in Central and Eastern Europe , Public Policy Centre, Cluj Napoca, pp. 20-35.

Roman, M., Voicu, C. (2010), *Câteva efecte socio-economice ale migraţiei forţei de muncă asupra ţarilor de emigraţie. Cazul României,* Bucureşti, Editura economie teoretică şi aplicată, vol XVII (2010), 7 (548), pp. 50-65.

Beciu, C., Lazar, M. (2014), *Migraţia forţei de muncă în contextul crizei economice Redefinirea mediatică a unei probleme publice,* Revista romana de sociologie,anul XXV, nr 3-4, pp. 233-254.

Anghel, R.G. , Horvath, I. (2009), *Sociologia migraţiei. Teorii şi studii de caz româneşti*, Iaşi, Editura Polirom.

Carling , J. (2014), *Scripting Remittances: Making Sense of Money Transfers in Transnational Relationships*, International Migration Review ,vol. 48, nr 51, pp. 218-262.

Massey, D.S., Arango, J., Hugo,G., Kouaouci, A., Pellegrino, A. and Taylor, J.E. (2009) *Worlds in Motion. Understanding International Migration at the End of the Millenium*, Oxford: Oxford University Press.

Hicks, J.R. (1932), *The Theory of Wages*, Palgrave Macmilian UK.

Jennissen, R. (2007), *Causality Chains in the international Migration Systems Approach* , Population Research and Policy Review, vol. 26.

Grosu, R.M. (2017), *International Migration-Economic Implications*, Amfiteatru Economic, nr. 19 (46), pp. 617-619.

Suiu, A. (2014), *Migraţia românilor în Spania. Dinamici şi consecinţe socio-teritoriale*, Geo-Carpatica, anul XIV, nr. 14.

Lee, E.S. (1966), *A theory of migration.* Demography, 3(1), pp. 47-57.

Massey, D.S., Arango, J., Hugo, G., Kouaouci and Taylor J.E. (1993), *Theories of International Migration: A Review and Appraisal,* Population and Development Review, 19 (3), pp. 431-466.

Ravenstein, E.G. (1885), *The laws of migration*, Journal of the Statistical Society of London, 2(48), pp 167-235.

Sjaastad, L.A. (1962), *The Costs and Returns of Human Migration*, Journal of Political Economy, 70(5), pp. 80-93.

Smith, A. (1785), *An Inquiry Into the Nature and Causes of the Wealth of Nations*, Dublin; Printed for Colles.