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Determinants of migration and the gravity model of migration – application on Western Balkan emigration flows

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Abstract

The main objective of this work is the investigation of the determinants of emigration from the Western Balkans through the well-known gravity theory. We include in the gravity equation three original regressors, associated with typical concerns for the Western Balkans: standard of living, unemployment and corruption. Diagnostic tests indicate a good fit of the estimated model to data. Authorities and policymakers of both developing and developed countries should definitely change the approach in dealing with the phenomenon of migration. They should implement drastic reforms and concrete measures in order to minimize the number of individuals who leave their country for economic and social reasons.

Keywords: Western Balkans; Gravity Model; migration determinants.

Introduction

International migration is the people movement from one country to another in order to live temporarily or permanently. This phenomenon is a result of several factors, which are related to both the origin and the destination country. People movement from the origin country is a consequence of difficult living conditions mainly associated with poverty, war or human rights violation. Migrants are attracted by characteristics of potential destinations, such as a high income per capita, a high level of security, freedom and the lack of discrimination. Migrants contribute to the development of their home country. On the other hand, the origin country might lose the skilled and educated individuals, process known as 'brain drain'. Integrated migrants are an added value to the labour market of the destination country. A poor management of incoming migration flows may lead to an increased unemployment rate, as well as to growing trafficking and other crimes.

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This work is structured as follows. We report in section 2 relevant facts regarding international migration and the corresponding economic and social determinants in Western Balkan (WB) countries. In section 3 we give a general overview of past theoretical and empirical works regarding migration theories and gravity models. In section 4 we estimate a particular gravity model for WB migration stocks in some important European destinations including classic and original independent variables. Section 5 reports the final remarks.

Migration trends and determinants

The global number of international migrants in 2015 was 244 million, about 3,3 per cent of the global population. The world has experienced a 60 per cent increase (or more than 91 million) in international migrants during the time period 1990-2015. In 2015, the United States of America, Germany and the Russian Federation were the most important destinations with respectively 46,6 million, 12 million and 11,6 million of migrants. Europe remains the continent with the greatest number of migrants, receiving 76 million in 2015, approximately 10 per cent of the total population.

Recent years governance in WB countries[1] has deepened wealth differences in the society. National resources and public projects are usually controlled by powerful national and international lobbies through non-transparent and suspicious procedures and contracts. This leads to the enrichment of a very small group of people and to the further impoverishment of the majority of the population. Corruption, clientelism and nepotism are present in every cell of the society, inhibiting the free initiative and the fair competition. These factors lead to increased tension and to a general dissatisfaction in the population. This situation is usually exploited by the opposition political parties, which may organize mass demonstrations, and in some cases encourage civil disobedience and violence. Soon or later, the opposition takes the power through the elections or a revolution, but this does not solve the social and economic impasse. In most cases, the new government continues the path of the old one: the country continues to be exploited by new and old lobbies. The progress is slow and often in the wrong direction. As a result, once again people lose hope; migration to developed countries remains the only solution for a significant part of the population.

[1] According to the European Commission website (available at: http://ec.europa.eu/trade/policy/countries-and-regions/regions/western-balkans/), Western Balkan region includes Albania, Montenegro, Kosovo, Croatia, Serbia, Bosnia and Herzegovina and Macedonia. In many scientific investigations and official reports, Croatia is not included in this group of countries, mainly due to the significant economic gap with the other WB countries; another important reason, obviously correlated with the economic development, is that Croatia is an EU member country since 2013 [Authors note].

WB countries are not only a migration source, but also a popular route for Asian migrants, who enter in Turkey and continue their journey to Greece or Bulgaria; Hungary is their next destination, which is the main gate to Western Europe. The armed conflict in Syria and Iraq has dramatically increased the number of migrants that follow this itinerary. Figure 1 shows the number of illegal border crossings on the WB route from 2009 to 2015. The number of persons who followed illegally this route in 2015 was nearly 764.000.

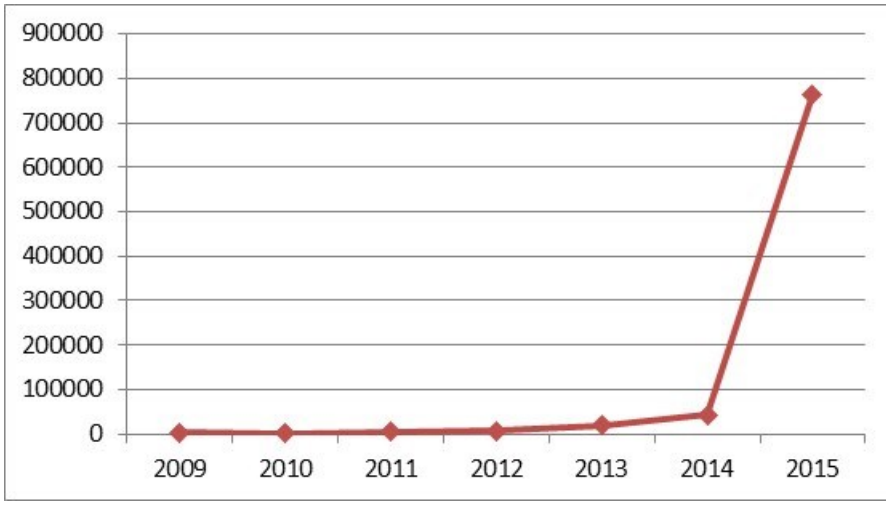


Figure 1. Illegal border crossings on the Western Balkans for the time period 2009-2015. [Source: Author's elaboration with data from the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (Frontex).]

Growing poverty was the principal factor that stimulated the recent years influx of WB emigrants into developed European countries. In figure 2, we represent the 2014 gross domestic product (GDP) per capita in the EU and in the WB countries.

The number of WB applicants for asylum in the EU has also increased in the last years. The principal destination is Germany. The real reasons associated to these applications are generally related to economic issues, so the probability to grant asylum is minimal. The total number of asylum applications in EU countries from WB citizens[2] was 538.140 for the time period 2009-2015; the largest groups for the same time period originated from Kosovo, Serbia and Albania with respectively, 33 per cent, 26 per cent and 21 per cent of all WB asylum seekers in EU.[3]

[2] Excluding Croatia
[3] Data from Eurostat (statistical office of the European Union), available at: http://ec.europa.eu/eurostat

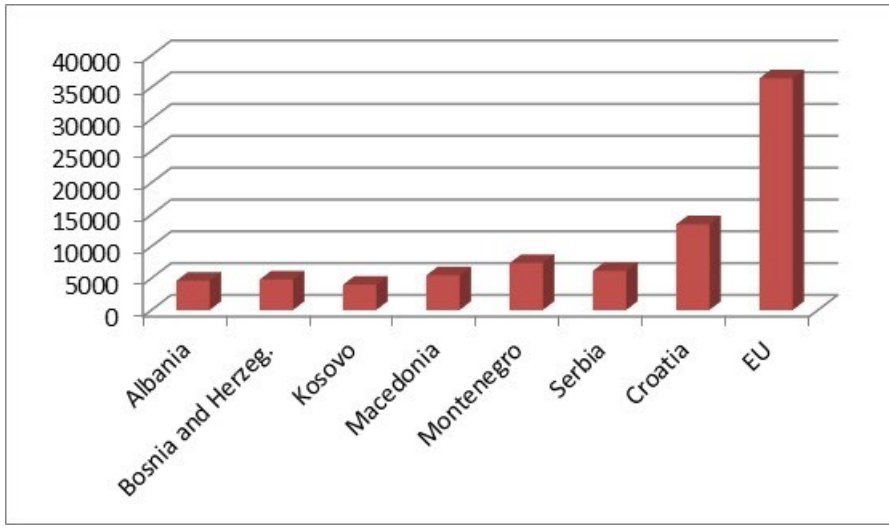


Figure 2. GDP per capita (in US dollars) in 2014 for the European Union and Western Balkan countries. [Source: Author's elaboration on World Bank data.]

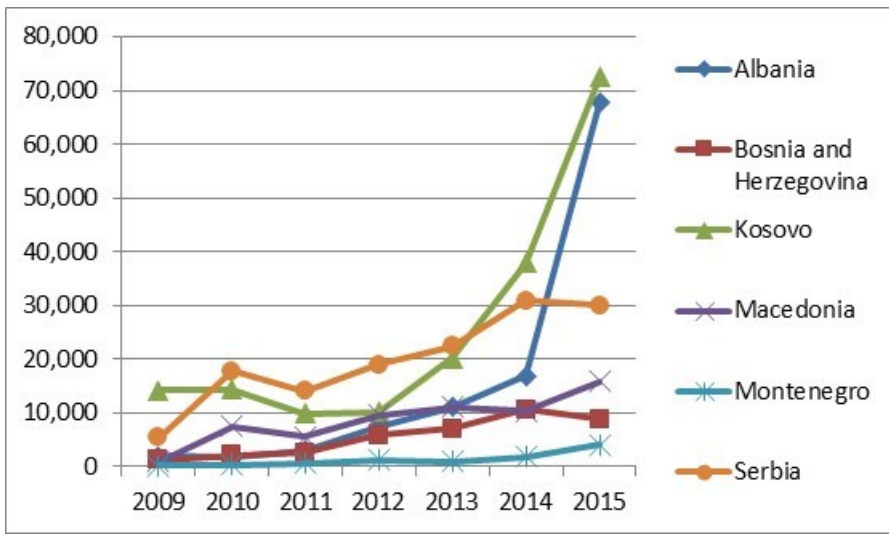


Figure 3. Number of WB nationals who have applied for asylum in the EU countries for the time period 2009-2015. [Source: Author's elaboration on Eurostat data.]

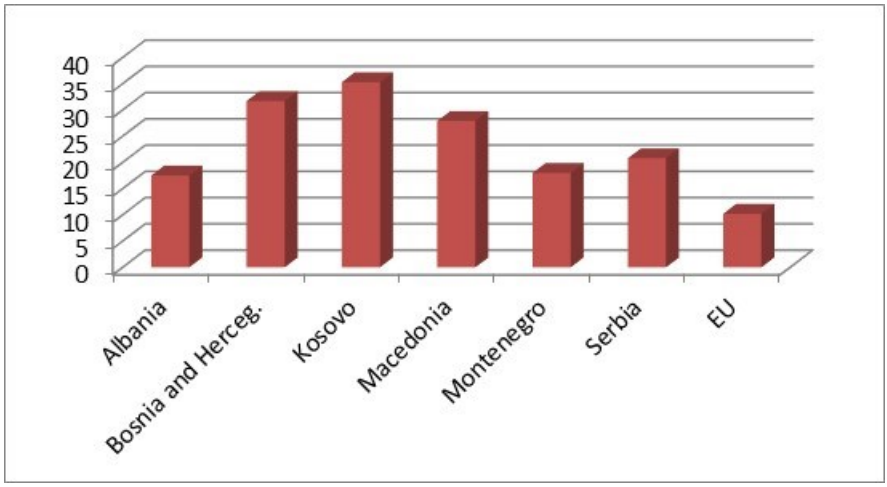


Figure 4. Unemployment rate in 2014 for the European Union and Western Balkan countries. [Source: Author's elaboration on World Bank and Eurostat data.]

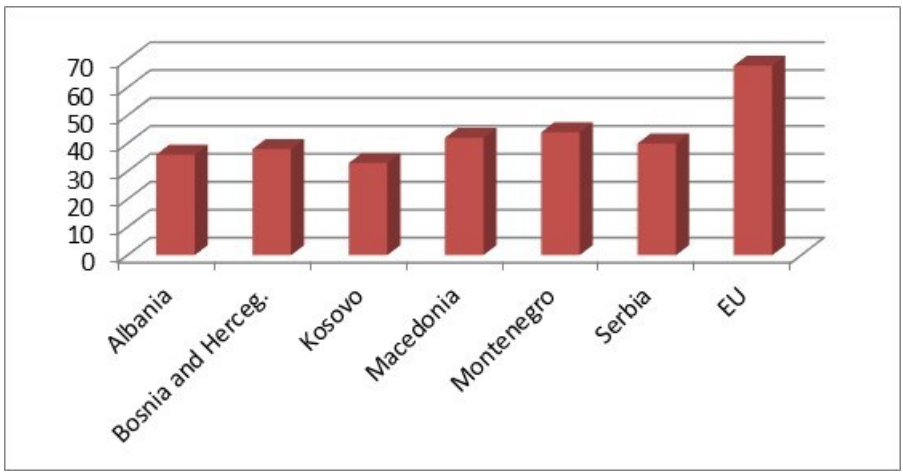


Figure 5. Corruption perception index (CPI) in 2014 for the European Union and Western Balkan countries. [Source: Author's elaboration on Transparency International (TI) data.]

High unemployment rates[4] (see figure 4) and relatively low salaries are other relevant push factors of international migration. The financial and economic crisis of 2007-2008 was also an important determinant of the WB countries progress.

[4] According to informal sources, the unemployment rate is at least 30 per cent in Albania [Authors note].

Initially, negative effects were limited due to the insufficient integration of WB financial markets; afterward, the crisis affected negatively international trade, remittances and foreign direct investments.

Corruption is also a serious threat to economic growth, development and human rights enjoyment in WB countries. Figure 5 shows the corruption perception index (CPI) in 2014 in the EU and in the WB countries. In 2014, average CPI score for EU countries was nearly 68[5]; Macedonia obtained the highest score among WB countries in 2014 (CPI of 45), while Kosovo and Albania recorded the worst performances (CPI of 33).

Theoretical and literature review

Theories of migration

Lee (1966) elaborated and enhanced the theory of Ravenstein (1885, 1889), including migration factors associated with the origin and destination countries, a set of intervening obstacles, and other personal factors. According to the author, the number of immigrants in a specific country is positively related with the level of the corresponding diversity of areas and people. Intervening obstacles and negative economic trends in home countries lead to the reduction of migration flows. As a result, we find high immigrant volumes in wealthier countries and a significant level of mobility in least developed countries. Every stream provokes a counterstream: a relevant part of immigrants return to their home country, due to possible future economic recessions or to the learning or developing particular skills.

We find two main approaches for the study of migration, affected by Ravenstein (1885, 1889) and Lee (1966): micro (or individual) and macro (or structural). At the macro approach, migration is stimulated by labour demand and supply differences between home and destination countries. At the micro approach, migration is analyzed in an investment contest; the decision to migrate to a wealthier country depends on the corresponding income difference, which is incorporated in a utility function. We can also find the meso approach, which is situated between the micro and the macro approaches. In this case, the decision to migrate is affected by legal and illegal intermediate structures. According to Cohen and Sirkeci (2011), classic theories do not take into account the dynamic nature of migration. The authors suggested an original framework, called 'cultures of migration', where human mobility is a function of conflict and tensions at the place of origin, and other specific characteristics. Conflict is measured along a continuous scale varying from cooperation to violence and it is present at the micro, meso and macro levels of analysis.

[5] On a scale from 0 to 100.

The gravity theory

In a gravity equation, the dependent variable, which corresponds to a flow of individuals or assets, depends on some variables related to the origin, variables related to the destination and other variables associated with the distance between countries. Many empirical estimations have shown the high explanatory power of gravity models. The first authors who estimated the gravity equations were Tinbergen (1962) and Pöyhönen (1963), affirming that bilateral trade flows are directly proportional to the respective sizes and inversely proportional to the distance. The first theoretical foundation for the gravity equation was determined by Anderson (1979) who explained that it can be derived from the properties of expenditure system. Bergstrand (1985, 1989, 1990) followed a similar approach to define a theoretical gravity equation, part of a general equilibrium model of international trade flow. Krugman (1979, 1980, 1991) developed another important theoretical framework, explaining the relation between trade flows, economic activity and economic geography. According to Deardoff (1998), gravity equations are based on standard trade theories and are part of a large class of models. Head and Mayer (2014) provided some correct methods of estimation and interpretation of gravity equations, and evidenced the lack of theoretical knowledge in underlying determinants of trade costs.

The gravity model of migration

The gravity theory is applied in this work for estimating and analyzing international migration. Newton's law of universal gravitation states that the gravitational force is directly proportional to the product of their masses and inversely proportional to the square of the corresponding distance:

$$F_g = G\frac{m_1 m_2}{r^2}$$

where F_g is the gravitational force between object 1 and object 2, G is the gravitational constant; m_1 is the mass of object 1 and m_2 is the mass of object 2; r is the distance between object 1 and 2. Countries take the place of objects in the gravity model of international migration. Masses are usually estimated by the respective populations or by indicators of the size of economy (e.g., gross domestic product). In this case, we have that:

$$MIG_{ij} = C\frac{P_i^{\alpha} P_j^{\beta}}{DIST_{ij}^{\gamma}}$$

where MIG_{ij} is the migration stock (or the migration flow) from origin i to destination j; P_i is the size of origin i and P_j is the size of destination j; $DIST_{ij}$ is the distance between origin i and destination j; C, α, β, and γ are coefficients that can be estimated through appropriate econometric techniques. Many well-known

estimation methods in econometrics are based on a linear relationship between variables. Let us the logarithmic transformation of the above expression, including the error term ε_{ij}:

$$\ln(MIG_{ij}) = C + \alpha\ln(P_i) + \beta\ln(P_j) - \gamma\ln(DIST_{ij}) + \varepsilon_{ij}$$

Gravity equations have been estimated for different types of international flows, such as foreign direct investments, bilateral trade, migration and tourism. WB studies on the gravity theory have been focused mainly on the analyses of international trade determinants, while the number of authors that have estimated the gravity models of migration or the relations between WB emigration flows and the corresponding factors is insignificant.

Ravenstein (1885, 1889) was the first author to apply the gravity theory on migration flows, affirming that migration is stimulated by hostile conditions in origin countries caused by 'push' factors like heavy taxation, oppressive laws, etc., and advantageous conditions in destination countries caused by 'pull' factors. According to Ravenstein's laws, poor economic conditions are the most important migration factors; migrants move generally to developed areas that are located near the origin countries; long distances migrants generally reside in big economic centres; every migration wave provokes counter-migration wave; people who reside in urban areas tend to migrate more than people who reside in rural areas; women migrate more than men, principally because they work outside their place of origin in factories and shops in developed areas. The gravity model of migration was estimated initially by Vanderkamp (1977), when he used the geographical distance between countries and the populations as independent variables. Karemera, Oguledo and Davis (2000) studied the impact of a set of variables on the size and composition of migration flows to North America using an original gravity equation. According to the model estimation, political instability and human rights violation encourage emigration. Clark, Hatton and Williamson (2007) analyzed the level and country-source composition of migration to the United States, following the logic of Borjas (1987) to evaluate the effects of non-financial costs. Outcomes indicated the validity of variables predicted by the theory, such as education, income, source country demography and immigration policies; furthermore, the variable of migration was inversely proportional to inequality following the Roy (1951) model logic. Pedersen, Pytlikova, and Smith (2008) estimated a gravity equation for migration flows, including some social determinants as explanators. They found evidences of a strong positive network effect, approximated by the stock of immigrants, on immigration flows. Business ties, linguistic closeness and former colonial were also positively related to the dependent variable and statistically significant, whereas the geographical distance between countries was negatively related with the immigration flows. Ortega and Peri (2009) estimated a 'generalized gravity equation' to analyze the relation between international migration flows and the corresponding economic and legal determinants, following

the logic of Grogger and Hanson (2007, 2008). Estimation results indicated the significant impact of severe immigration policies on the reduction of migrant flows. Kim and Cohen (2010) formulated two econometric models for international migration inflows and outflows to and from developed countries using social, historical, demographic and geographic variables, such as colonial and language linkages, population, infant mortality rate and distance. Authors found evidences of a strong statistical relation between demographic and geographic variables, and migration inflows; population of home and destination countries, the corresponding distance and infant mortality rate of host country were the variables with the greatest impact on migration outflows. Grogger and Hanson (2011) model for international migration was based on Roy (1951) framework of self selection on earnings. Authors argued that skilful people are more likely to migrate and to reside in high income countries. According to Beine, Bertoli and Moraga (2015) the use of bilateral flows in the gravity model brings simultaneously positive and negative consequences; the positive effects are related to the possibility of the determination of some relevant international migration factors, like cultural links and poverty constraints, whereas the negative effects are connected with the different complex techniques, required for estimating these models. The authors underlined the necessity of taking into account some relevant problems connected with the statistical models estimation, such as the presence of zero observations, the multilateral resistance to migration and the correlation of the independent variables with the error term in the regression models.

Empirical analysis

The proposed gravity equation

In this section, we define and estimate[6] an original gravity equation, including basic and some experimental explanators. The considered dependent variable is the number of immigrants from a WB country in a developed European country at a specific year. The independent variables in the basic equation includes the origin and destination populations and the corresponding distance, which approximates migration costs. We consider other explanators, which are related to home and host countries. GDPs per capita at origin and destination countries have been used as income estimators by many authors (Beine et al., 2015). We also include three original variables that represent some typical social and economic problems for WB citizens, such as the standard of living, corruption and unemployment. We consider the following augmented gravity model, where all variables are expressed in natural logarithm:

[6] The augmented gravity model was estimated through *plm*, a package of R software for panel data estimators. R was also used for the corresponding diagnostic.

$$mig\_odt = \alpha_1 + \alpha_2(gdpcap\_ot) + \alpha_3(pop\_ot) + \alpha_4(gdpcap\_dt) + \alpha_5(pop\_dt)$$
$$+ \alpha_6(dist\_od) + \alpha_7(unemp\_diff\_odt) + \alpha_8(cpi\_diff\_dot) + \alpha_9(hdi\_diff\_dot) + \varepsilon\_odt$$

We report in table 1 the definition and the expected sign, or the corresponding expected effect on migration stock, for each variable. A considerable number of authors have used migration stocks in place of flows (Ortega et al., 2009; Grogger et al., 2011); stocks data are more reliable than data on migration flows.

Table 1. Definition and expected sign of gravity model variables.

Variable	Definiton	Expected sign
mig_odt	Migration stock in destination d from origin o at year t	Dependent variable
gdpcap_ot	GDP per capita in origin o at year t	-
pop_ot	Population in origin o at year t	+
gdpcap_dt	GDP per capita in destination d at year t	+
pop_dt	Population in destination d at year t	+
dist_od	Distance between origin o and destination d	-
unemp_diff_odt	Difference between unemployment rates in origin o and in destination d	+
cpi_diff_dot	Difference between corruption perception indexes in destination d and in origin o	+
hdi_diff_dot	Difference between human development indexes in destination d and in origin o	+

Our dataset includes WB migrant stocks in some of the most important destinations and the corresponding determinants for the time period 2009-2014. We have listed in table 2 the considered pairs of destination and origin countries. Our primary source of migrant stocks was the statistical office of the EU (Eurostat) and the Organisation for Economic Co-operation and Development (OECD). GDPs and the population data were obtained by the World Bank databases, whereas the bilateral distances between home and host countries were sourced from CEPII GeoDist database (Mayer et al., 2011). Corruption perception indexes were obtained from Transparency International (TI). Unemployment rates were collected from Eurostat and the World Bank. Human development indexes (HDI)[7] were sourced from the United Nations Development Programme (UNDP). We also

[7] The Human Development Index (HDI) is an estimator of the standard of living, life expectancy at birth and the education level, annually measured by the United Nations Development Programme (UNDP).

consulted the WB an EU national statistical offices database to replace a limited number of missing values for different variables.

Table 2. Couples of origin-destination countries included in the dataset.

Origin	Destination	Origin	Destination
Albania	Belgium	Macedonia	Austria
	Denmark		Belgium
	Germany		Germany
	Italy		Italy
	Switzerland		Switzerland
Bosnia and Herzegovina	Austria	Montenegro	Germany
	Denmark		Italy
	Germany		Netherlands
	Norway		Sweden
	Switzerland		Switzerland
Kosovo	Germany	Serbia	Austria
	Italy		France
	Norway		Germany
	Sweden		Italy
	Switzerland		Switzerland

In the following table, we have calculated some basic descriptive statistics for all the variables taken into consideration in their original form.

Table 3. Descriptive statistics for the considered variables in their original form.

Variable	**Mig**	**gdpcap_o**	**pop_o**	**gdpcap_d**
MIN	21	3209,69	618294	34854,40
MAX	495709	7370,86	7320807	102832,26
Mean	59431,84	5061,94	3073669,72	56226,74
Median	19756	4689,16	2485050	47727,90
Variance	8192602248	1287090,59	4,43919E+12	358011318
Std. Deviation	90512,99	1134,50	2106937,43	18921,19
Asymmetry	2,94	0,49	0,979483009	0,92182251
Kurtosis	10,10	-0,77	-0,09	-0,37

Variable	**pop_d**	**dist**	**unemp_diff**	**cpi_diff**	**hdi_diff**
MIN	4828726	509,75	3,20	2	0.071
MAX	81902307	2047	42,20	65	0.239
Mean	33463727,57	1191,92	18,46	39,31	0.158
Median	10243024	1182,16	18,25	44	0.158
Variance	9,91916E+14	187760,40	71,29	304,13	0.002
Std. Deviation	31494705,36	433,31	8,44	17,44	0.039
Asymmetry	0,53	0,19	0,35	-0,93	-0.047

Kurtosis	-1,56	-0,94	-0,47	-0,11	-0.736

Estimation results

Pooled OLS was the estimation method that performed better. In this case, the estimator does not take into account the panel structure of the sample. We suppose the absence of simultaneous correlation between the explanators and the error term; there is no unobserved heterogeneity in the country pairs. In table 4 we report the original output of the estimated gravity model. We observe that parameters signs are in line with the expectations and we confirm the statistically significant effects[8] of the independent variables. The adjusted R-squared is 0,7011, so our model explains about 70 per cent of the variation of migraton stocks. These findings are similar to past empirical estimations (Pedersen et al., 2008; Ortega et al., 2009, 2013; Grogger et al., 2011).

In figure 6 we report some relevant residual graphs for the estimated model. We observe an irregular fluctuation of residuals around zero. There are also evidences of long tails of the distribution function. We can conclude that model residuals are approximately normally distributed. Regardless of the gravity model popularity and its relevant explanatory power, we cannot overlook the lack of theoretical foundation connected with the individual behaviour. The extensive application of gravity models is also related with their simple functional form; i.e., after the logarithmic transformation, we can use some well-known estimation techniques. Generally, researchers do not take into account the fact that migration and other types of spatial interaction data cannot be always explained by linear regressions (i.e., gravity models).

Final remarks

The main focus of this work was the empirical analyses of WB migration determinants, through the gravity theory. Emigration flows from WB countries has dramatically increased during the recent years. Growing economic and social inequalities in the region and visa liberalization for Albania, Bosnia and Herzegovina, Serbia, Macedonia and Montenegro are some of the main factors of this unusual influx of refugees towards western Europe. Wealth is concentrated in the hands of a small so-called elite, whereas a significant part of the population lives below the poverty line. WB countries are also characterized by a high level of corruption, which slows the economic growth and further increases the tension.

In this work we defined and estimated a particular gravity equation for WB migrant stocks in some main European destinations, including classic and some original explanators related with typical problems for WB countries such as the standard of living, corruption and unemployment. Results indicated a relatively high

[8] Significance level (alpha) of 5 per cent.

explanatory power of the estimated model and the statistic significance of the considered independent variables. Governments of developed and less developed

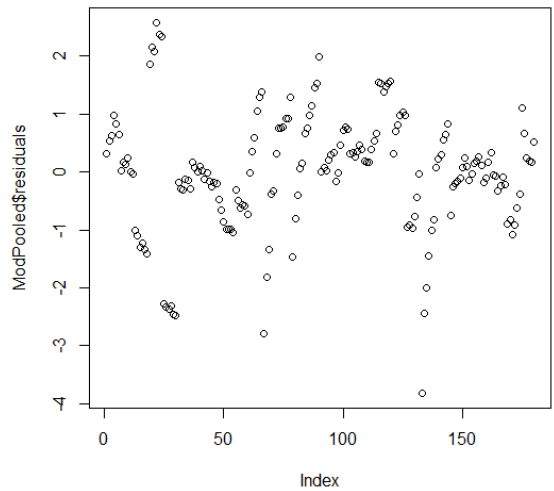
Table 4. Original commands for estimating the gravity model of migration and the corresponding output from R software.

```
> ModPooled <-
plm(mig~gdpcap_o+gdpcap_d+pop_o+pop_d+dist+unemp_diff+
cpi_diff+hdi_diff,data=data,model="pooling",index = c("code", "year"))
> summary(ModPooled)
Oneway (individual) effect Pooling Model

Call:
plm(formula = mig ~ gdpcap_o + gdpcap_d + pop_o + pop_d + dist + unemp_diff
+ cpi_diff + hdi_diff, data = data, model = "pooling",
   index = c("code", "year"))

Balanced Panel: n=30, T=6, N=180

Residuals :
  Min. 1st Qu.  Median 3rd Qu.    Max.
-3.6900 -0.4500  0.0708  0.5980  2.4000

Coefficients :
              Estimate      Std. Error    t-value     Pr(>|t|)
(Intercept)  -13.90564     7.26161    -1.9150     0.0571678 .
gdpcap_o      -1.69860      0.68307    -2.4867     0.0138520 *
gdpcap_d       1.50006      0.52406     2.8624     0.0047306 **
pop_o          1.22396      0.12232    10.0065     < 2.2e-16 ***
pop_d          1.02709      0.11668     8.8024     1.432e-15 ***
dist          -2.45711      0.26718    -9.1965     < 2.2e-16 ***
unemp_diff     0.65609      0.17047     3.8487     0.0001675 ***
cpi_diff       0.41796      0.17379     2.4049      0.0172429 *
hdi_diff       1.21904      0.47269     2.5790     0.01075 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    683.8
Residual Sum of Squares: 179.14
R-Squared:      0.7380
Adj. R-Squared: 0.7011
F-statistic: 60.2179 on 8 and 171 DF, p-value: < 2.22e-16
```

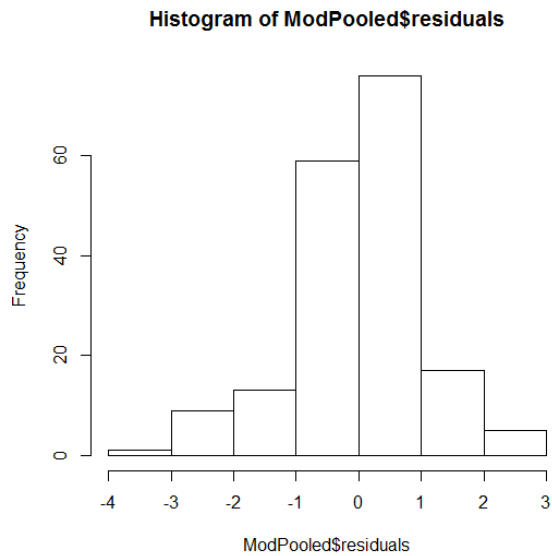
('Estimate'=the value of the estimated parameter; 'Std. Error'=the standard error of the estimated parameter; 't-value'=the estimated value of t-test for the estimated parameter; 'Pr(>|t|)'=p-value for the estimated parameter.)

Figure 6. Graphical representations and diagnostic of model residuals and the corresponding distribution.

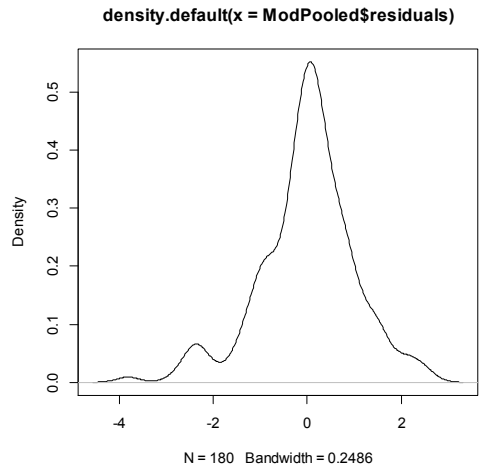
6A. residuals graph



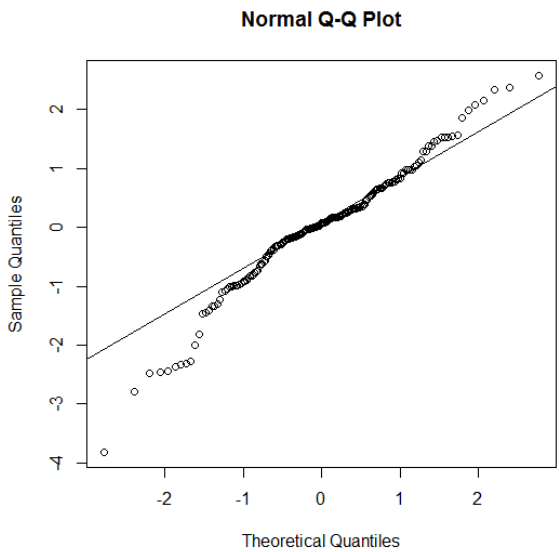
6B. histogram of model residuals



6C. probability density function of model residuals



6D. normal probability plot for model residuals



countries should definitely change the approach in dealing with the phenomenon of migration. Drastic reforms and concrete measures should be implemented in order to minimize the number of individuals who leave their country for economic and social reasons. On the other hand, authorities of developed countries should

contribute to the integration of incoming migrants and to the protection of their rights.

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