

## **A macroeconometric panel data analysis of the shaping factors of labour emigration within the European Union**

**Liana SON**

West University of Timisoara  
liana.son@feaa.uvt.ro

**Grația Georgiana NOJA**

West University of Timisoara  
gratiela.carica@feaa.uvt.ro

**Abstract.** *The research aims to identify and analyse the determinants and shaping factors of labour emigration within the European Union. The analysis is based on developing double-log macroeconometric models that combine cross-section and time series in a panel structure, by using a set of indicators specific for the emigration process, as well as for the economic activity, labour market and education, as main explanatory variables. The results show that high unemployment reduces the emigrant stock, mainly due to the loss of associated income and to the reduction of the migrants' capacity to move and establish into another country. At the same time, we identified a positive selection of emigrants at destination according to their educational level, while an increase in education in the source country downsizes the stock of emigrants mainly due to an improvement in employment perspectives.*

**Keywords:** international migration; labour market; unemployment; education; macroeconometric modelling.

**JEL Codes:** J01, J08, O15.

**REL Codes:** 12I, 8G.

## 1. Introduction – International labour migration in Europe

The technological progress has led to a downsize of geographical barriers faced by the labour force in the process of free movement, by facilitating the transmission of information concerning various job opportunities from a certain host country to various migrant sending countries.

Macroeconomic changes from the past 30 years, induced by globalisation, production rationalisation or increased sector differentiation, have shaped a different scenario for the European labour market, compared to the existing one in the 1960s and 1970s in Europe (Menz, Caviedes, 2010, p. 2). International labour migration is seen as a challenge in Europe, especially concerning the unskilled labour (Zimmermann, 2005). At the same time, human capital, especially the highly skilled labour, represents one of the main resources, developed countries facing a surplus of demand for skilled workers that can't be covered by the local labour force trained within the national education system. Thus, developing countries become extremely competitive in providing skilled labour to cover this gap. Nevertheless, unlike North America, Australia or New Zealand, Europe does not hold a certain specific place in the international labour market for tertiary educated workers.

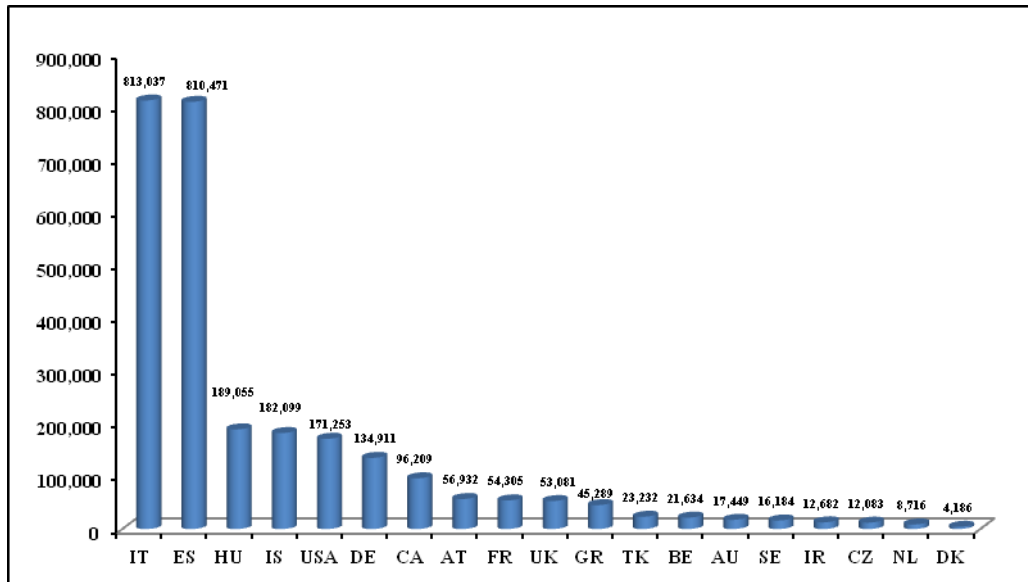
At the same time, unfavourable demographic conditions, the lack of skills, competencies, as well as the persistence of high unemployment have led to a reconsideration of restrictive international labour migration policies by the policy makers in Europe. Moreover, structural changes of the political European economy have a significant impact on international migration policies and strategies. The process of European integration generated various changes in the structure, origin and destination of the migrant flows, while the anxiety towards emigrants from Central and Eastern Europe highlighted the importance of a gradual approach of migration, focused on those issues that don't reveal controversies.

EU-15 net migration registered about 600,000 persons by year in the last five years of the twenty century, representing only half of the migrant flows registered in the US. Still, in the next five years, the amount doubled and, for the first time, the European migrant flows have become larger than those registered in the US (Menz, Caviedes, 2010, p. 129). In 2003, the net migration in Europe reached the stepping stone of 2 million people (Eurostat, 2009, p. 54). This increase in the migrant flows was accelerated by the European Union enlargements in 2004 and 2007. On average, between 2004 and 2008, net increase of immigrants in the EU-15 reached 250,000 people from the eight New Member States (NMS) in 2004, especially from Poland, and approximately 300,000 persons from the two New Member States in 2007,

mainly from Romania (Brucker et al., 2009, pp. 23-27). Thus, we can observe that the population increase from Central and Eastern Europe towards the EU-15 during the first eight years of the XXI century was robust and constant, taking into consideration that the Romanian emigrants were seven times larger in 2007 than in 2000, while the migrants from Lithuania and Slovak Republic were five times bigger than in 2000.

Overall, in 2007 the European Union (EU-27) hosted about 29.1 millions of foreign citizens, of which 10.6 million were intra-EU migrants (European Commission, 2008, p. 115). Approximately 40% of those migrants were citizens of the EU New Member States, mostly coming from Romania (1.6 million), Poland (1.3 million) and Bulgaria (310,000). These statistics point out that about 7.2% persons of the Romania's population, 4.1% of Bulgaria's population and 3.4% of Poland's population benefits from the free movement right to live in a different country than the origin one, as citizens of the European Union (Menz, Caviedes, 2010, p. 129). Emigration was also high in Lithuania and Cyprus due to the fact that more than 3% of the working age population moved from the origin country to the other EU Member States. These statistics undermine the real number of migrants, because they don't include temporarily or seasonal migration, or the migrants that frequently move from one country to another within the European Union, respectively from the origin to destination country. At the same time, these statistics don't include return migration or the persons that benefited previously from their legal rights as citizens of the European Union.

Concerning the receiving countries, about 70% of the citizens from the eight EU New Member States in 2004 (except for Malta and Cyprus), that migrated within the European Union, have established in the United Kingdom and Ireland, mainly due to their dynamic economies and to the open migration policies (Brucker et al., 2009, p. 23). On the other hand, the main destinations of the Romanian workers are represented by the South-European countries, especially Italy and Spain.



Source: performed based on World Bank Migration Database 2011.

**Figure 1.** *Bilateral estimations of migrant stocks for Romania, 2010*

The estimations concerning the emigration of citizens from the New Member States are being influenced by several factors, such as economic requirements (low wages, high unemployment rates, the decline of specific industrial sectors, labour market deregulation), as well as the migrants' general desire of improving life conditions and ensuring a better future for their family. The importance of motivations for improving the social or professional status varies largely among most of the workers from the New Member States that migrated in EU-15, while the economic reasons remain essential for most of them (Menz, Cavedes, 2010, p. 134).

## 2. Labour emigration literature review – a critical analysis

The economic approach of international migration theories highlights three guidelines for the analysis of the labour emigration/immigration, respectively the identification and assessment of the factors that shape the size and structure of migrant flows, of the way in which migrants adapt to the host country, as well as the migration impact of origin and host economies (Borjas, 1989).

The migration model represents a relationship that links international labour migration and the variables identified by the economic theory. The most

important migration models found in the literature can be grouped into two main categories: (i) models used for the analysis of the determinants and shaping factors of international migration and (ii) models which assess its impact on the labour market, as well as on the origin and host economies. The multiple regressions were mainly used in order to test different hypotheses developed starting from the fundamental international migration models and theories, based on a set of dependent variables (net migration, emigration rate, the number of immigrants) and explanatory variables (GDP growth, GDP per capita, education, wage differentials, unemployment rate, inflation rate).

The identification of the factors which generate and shape international labour migration represents one of the most debated research questions in literature, as well as among experts. Thus, there are several essential aspects required for the analysis and assessment of migration impact on sending and receiving countries referring to the determination of the size, structure, prevailing characteristics and of the way in which international migration contributes to socio-economic development (Fan, Stark, 2011).

The main migration approach in literature highlights that labour migration results from the inequalities or wage differentials between sending and receiving countries, generated by the discrepancy in the levels of socio-economic development (Goss, Lindquist, 1995). To this respect, migration is sometimes simply seen through labour movements, while the social, cultural, political and institutional dimensions of the phenomenon are subordinated to economic rationality (Schiller et al., 1992).

Fan and Yakita (2010) analysed the effects generated by an increase in wages for highly skilled workers on the decisions adopted by individuals within the origin country concerning emigration and education, respectively on the labour market equilibrium. The main results denote that an increase in wages in the home country encourages highly skilled labour emigration, generating major (negative) inferences on economic growth for developing sending countries (brain drain) (Miyagiwa, 1991), as well as positive effects on productivity and equality within the origin country (brain gain) (Mountford, 1997, Stark et al., 1997, Beine et al., 2008).

Recent studies on the determinants of labour emigration (Clemens, 2011, Kim, Cohen, 2010, Hoti, 2009) reveal the importance of demographic, geographic and social variables in the analysis of emigration rates, respectively of the predilection to emigration. Thus, Kim and Cohen (2010) quantified the determinants of migrant flows towards 17 industrialised countries from 13 countries during 1950-2007, using 77,658 observations from multiple sources in a panel data analysis. The variables were transformed by using their logarithm in order to build a quantitative model suitable for demographic

forecasts, the dependent variable being represented by the number of migrants, while the explanatory variables describe the population of both origin and host countries, population density, infant mortality rate and life expectancy, as well as the distance between capitals. The results point out the fact that social and historic determinants have a small influence on migrant flows, unlike the demographic and geographic factors, that have a major impact on shaping these flows.

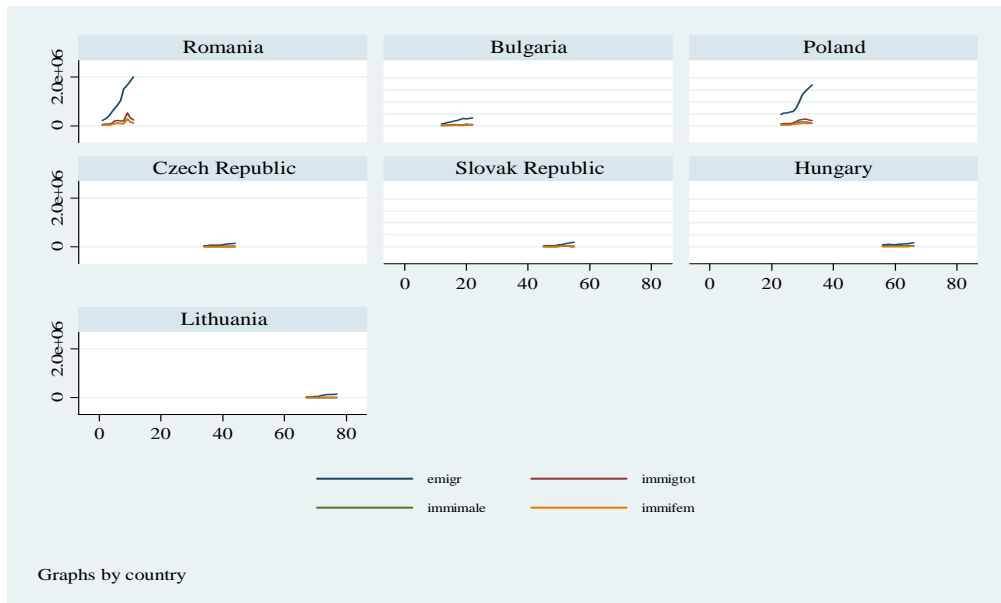
Taking into consideration all these aspects, the main objective of the performed research is described by the macroeconometric analysis of the shaping factors of labour emigration within the main sending countries from Central and Eastern Europe, members of the European Union. In order to accomplish this objective, the research is based on developing macroeconometric models that highlight, through the explanatory variables used within the analysis, the main determinants and shaping factors of labour emigration within a panel of seven countries from Central and Eastern Europe.

### **3. Methodology and developed models: equations, specifications, hypotheses and testing**

Labour emigration from the New Member States of the European Union in Central and Eastern Europe towards the South-West Europe was emphasised by the enlargements in 2004 and 2007, free movement of persons, respectively of workers, being one of the four freedoms granted by the European Union through its essential treaties.

In order to analyse the determinants and shaping factors of labour emigration from the New Member States of the European Union we developed and tested specific models, using panel data during 2000-2010 for a group of seven Central-European countries, members of the European Union since 2004 (Poland, Czech Republic, Hungary, Slovak Republic and Lithuania) and 2007 (Romania and Bulgaria).

The main reasons for choosing the seven specific emigration countries from Central and Eastern Europe consist of significant evolutions of the process during the last decade, studies such as the one performed by Brucker et al. (2009) pointing out that by the end of 2007 the data on international migration captured from the host countries statistics reveal a stock of 3.8 million emigrants from the New Member States of the European Union that live in EU-15. The main sending countries are Romania (1.6 millions) and Poland (1.3 millions).



**Source:** performed based on panel data through Stata 11 econometric package.

**Figure 2.** Panel trends in the stock of emigrants and the flow of immigrants by citizenship, 2000-2010

The ratio of emigrants in the total population of sending countries varies largely accordingly to the level of income per capita: while emigration rates are relatively low in Czech Republic (1.0%), Hungary (1.3%) and Slovenia (1.8%), these are very high in the case of Romania (7.2%), Bulgaria (4.1%), Lithuania (3.8%) and Poland (3.4%). Thus, in order to analyse the determinants and shaping factors (*push factors*) of the emigration process for the seven origin countries from Central and Eastern Countries, we developed an econometric model based on panel data, which combines cross-sections with time-series, through a set of specific indicators. The emigration data are taken from a relatively new and complex set of indicators developed by Brucker et al. (2009), while for the other indicators regarding the economic activity and the labour market we used data series from Eurostat and the World Bank.

The model is developed as a multiple regression model, respectively a *double-log* and a *semi-log* regression model. At the same time, we used a *dynamic model* based on time lags of the dependent variable, focusing on *random* and *fixed effects* within the panel.

We performed a complex set of tests in order to verify the statistical significance of the coefficients and to validate the hypotheses of the model, thus: the differentiation of the coefficients estimated through both types of

models with random and fixed effects was performed by implementing the *Hausman* test; the hypothesis of no serial correlation of the residuals was performed through the *Wooldridge – Lagrangian Multiplier* test; the homoscedasticity hypothesis was validated through *Breusch-Pagan Lagrangian Multiplier* test for random effects models, respectively through the modified *Wald* test for group-wise heteroscedasticity in the fixed effects models; the assumption of no multicollinearity was tested with the help of the explanatory variables *correlation matrix* and by performing the auxiliary regressions, while the validation of individual and jointly influence of exogenous variables on the dependent variable was accomplished through *Wald, Fisher* and *t-statistic* testes, as well as through the analysis of variance (ANOVA).

The model and associated data were processed with the Stata 11 econometric package, using variables with panel data for the seven emigration countries and a time dummy variable (from 1 to 77) for the 2000-2010 period. In order to estimate the parameters of the random effects model we used the GLS method (*GLS - Generalized Least Squares*).

The main objective of the empirical regression analysis is to explain as much as possible from the variation of the dependent variable (a specific emigration indicator) through the variation of the explanatory variables used within associated models.

#### *General form of the model*

The model developed for the analysis of the determinants and shaping factors of labour emigration follows the research of Agbola and Acupan (2010) and has the general form of a multiple regression model with panel data. Thus, for panel data, the general linear representation of the model is described as follows (Baum, 2001, p. 219):

$$\begin{aligned}
 y_{it} &= \sum_{k=1}^k x_{kit} \times \beta_{kit} + \varepsilon_{it} \\
 i &= 1, \dots, N \\
 t &= 1, \dots, T
 \end{aligned}
 \tag{1}$$

where:  $N$  represents the number of panel units (countries), while  $T$  signifies the number of periods (time).

The general form of the developed model comprises several explanatory variables used within the analysis of the migration process for considered panel countries:

$$Y_{it} = \beta_1 \times X_{1it} + \beta_2 \times X_{2it} + \beta_3 \times X_{3it} + \dots + \beta_k \times X_{kit} + \varepsilon_{it}, i = 1, \dots, n
 \tag{2}$$



The proposed model uses the logarithm of the variables in order to capture a precise estimation of parameters, respectively of the influence of different variables on the emigration process, thus taking the general form of a *double-log model*, with the following configuration:

$$\begin{aligned} \log(Y_{it}) = & \beta_1 \log(X_{1it}) + \beta_2 \log(X_{2it}) + \beta_3 \log(X_{3it}) + \dots \\ & + \beta_k \log(X_{kit}) + \varepsilon_{it}, i = 1, \dots, n \end{aligned} \quad (3)$$

The model's general equation can be rewritten under the following form:

$$\begin{aligned} \log(EM_{it}) = & \beta_0 + \beta_1 \log(IRdef_{it}) + \beta_2 \log(UR_{it}) + \beta_3 \log(GDP_{it}) + \beta_4 \log(PD_{it}) + \\ & \beta_5 \log(LE_{it}) + \beta_6 \log(IMR_{it}) + \beta_7 \log(INEQ_{it}) + \beta_8 \log(EDUC_{it}) + \\ & \beta_9 \log(TERTed_{it}) + \beta_{10} \log(WGs_{it}) + \varepsilon_t \end{aligned} \quad (4)$$

where:

- $EM$  = emigrant stock;
- $IRdef$  = inflation rate, GDP deflator;
- $UR$  = unemployment rate;
- $GDP$  = gross domestic product per capita;
- $PD$  = population density;
- $LE$  = life expectancy at birth;
- $IMR$  = infant mortality rate;
- $INEQ$  = inequality – Gini coefficient;
- $EDUC$  = persons with upper-secondary and tertiary education;
- $TERTed$  = female to male tertiary education ratio;
- $WGs$  = monthly minimum wage.

The developed model comprises, through its explanatory variables and accordingly to the literature, the determinants and shaping factors of the emigration process. Thus, within our empirical analysis, we focus on the sending country specific elements, by assessing the *push factors*, and to a smaller extent on the *pull factors*, as characteristics of the host countries. Nevertheless, our performed analyses take into consideration the particularities and characteristics of the economic activity, economic growth and the level of economic development and macroeconomic stability for considered panel origin countries, as well as the demographic aspects (population density) and labour market elements (unemployment, working conditions, wages), respectively the educational background. Thus, the explanatory variables include inflation rate and unemployment rate within the perspective of migration costs and macroeconomic stability, as well as demographic and socio-development indicators describing population health and overall life quality along with the wages, inequality and the educational level.

#### 4. Results and discussions

Based on our specific methodology, we developed two multiple regression models with cross-section and time series combined on panel data, using random effects through least squares method (*GLS – Generalised Least Squares*). At the same time, we processed our developed models based on the fixed effects method, still, the Hausman test applied in order to choose between the two categories of parameters has validated the results of the random effects models.

The models have been tested and assessed based on their validated hypotheses, generating accurate conclusions adequate for identifying and analysing the determinants and shaping factors of the emigration process for considered countries analysed within the panel. The main results are detailed and presented in Table 1.

Table 1

**Results of the developed models based on the logarithm of the emigrant stock as endogenous variable, random effects (RE), GLS method**

	Model 1			Model 2		
	b/se	p	t	b/se	p	t
Log Inflation rate	0.174** (0.07)	0.009	2.613	0.171* (0.07)	0.011	2.531
Log Unemployment rate	-0.654*** (0.18)	0.000	-3.542	-0.565*** (0.15)	0.000	-3.882
Log GDP per capita	-0.346 (0.29)	0.032	-1.196	-0.446 (0.26)	0.092	-1.687
Log Population density	0.952* (0.40)	0.018	2.361	0.749* (0.36)	0.040	2.056
Log Life expectancy	32.337*** (6.04)	0.000	5.354	29.386*** (5.94)	0.000	4.950
Log Infant mortality	2.665*** (0.38)	0.000	7.093	2.768*** (0.32)	0.000	8.650
Gini Inequality	0.155*** (0.02)	0.000	8.220	0.166*** (0.02)	0.000	9.126
Log Education	-0.425 (1.71)	0.103	-0.249			
Log Gender tertiary ed	1.291 (0.70)	0.067	1.831			
Log Minimum wage	1.704*** (0.39)	0.000	4.415	2.061*** (0.35)	0.000	5.878
Constant	-150.168*** (25.71)	0.000	-5.840	-133.772*** (24.09)	0.000	-5.554

Adjusted R-squared 0.989 0.987  
N observations 814.000 616.000

\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Note:** The standard errors are presented in brackets; the models are estimates through random effects for each country within the panel and comprise a time dummy variable.

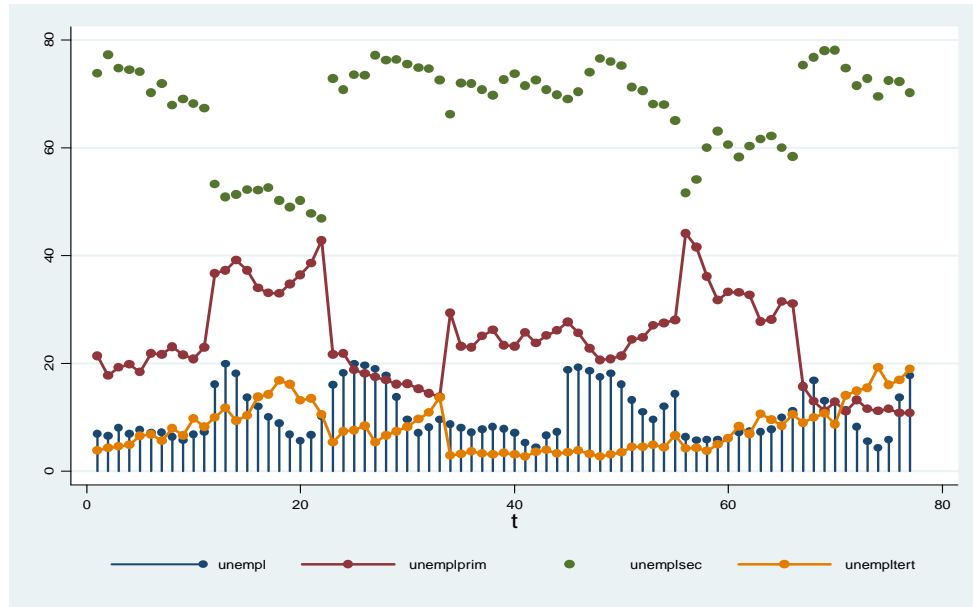
**Source:** own process of panel data with Stata 11 econometric package.

Both models highlight the major importance of considered explanatory variables in shaping emigration trends, the associated coefficients estimated by the random effects model (RE) being statistically highly significant, at 0.1% level. Thus, by analysing the obtained results we can observe that the major impact on emigration stock is generated by the labour market variables and inequality, as well as by the socio-demographic indicators. Within this context, the model estimates that a 1% increase in unemployment generates a 0.654% reduction of the stock of emigrants, the tendency being associated with a deepening of labour market pressures, as well as with the fact that the job loss implies the absence of associated income and, thus, an important reduction of the capacity and financial resources necessary for moving to another country, through emigration. Nevertheless, especially for persons with a low income, an increase in the monthly minimum wage can provide some of the resources required by the emigration process and, thus, an increase in the stock of emigrants (with about 1.704%).

Labour migration viewed as an investment in human capital is reflected by the obtained results that point out a reduction in the stock of emigrants with 8.565% when the number of persons with upper-secondary and tertiary education increases by 1%. At the same time, if the tertiary educational gap is being lowered between men and women, then, according to the RE model estimation, the stock of emigrants will decrease with 2.721% for the countries analysed within the panel.

High unemployment levels are mainly registered among persons with primary and secondary education, thus an improvement in the educational level of the labour force and its harmonization between men and women leads to increased employment opportunities and higher wages, being able to reduce the stock of emigrants for the considered panel countries.

*The functional perspective* on international labour migration focuses on microeconomic processes, especially on the decisional behaviour of individuals, which, in their desire to improve the living standard, react to perceived and real inequalities in the distribution of economic opportunities, by emigrating to a different country. The results obtained to this respect after processing the econometric model highlights the fact that a 1% increase in inequality measured by the Gini coefficient increases the stock of emigrants by 0.155%, while an improvement in the living standard reflected through the increase of GDP per capita reduces emigration by 0.346%.



Source: performed based on panel data through Stata 11 econometric package

**Figure 3.** Panel evolution of unemployment rate: total, primary, secondary and tertiary education, 2000-2010, %

The impact of demographic variables on the stock of emigrants is extremely significant (at 0.1% level), an increase in population density inducing a slight increase in emigration, while high infant mortality rates, an indicator associated with population health and life quality, intensify the emigration process.

## 5. Conclusions, research limitations and opportunities

By analysing the results obtained after processing the two double-log multiple regression models developed based on random effects (RE), we could observe that in the case of the sending countries considered within the panel we find several foundations of the *neoclassical perspective on international migration*. This theory analyses wage differentials and employment conditions between countries, as well as the costs associated with international labour migration, by approaching migration within the perspective of an individual income maximizing decision. Thus, migrants are searching for a country that will maximize their welfare (Borjas, 1989), but this searching process is limited

by the financial resources of individuals and by the immigration and emigration policies and regulations defined by host and origin countries. At the same time, the neoclassical approach of international migration highlights the fact that sending and destination countries have a major impact on the number of immigrants, as well as on the structure of associated flows, through specific policies and various changes in the economic activity.

The results reveal that income, wage differentials, working conditions and the real or perceived inequalities represent the main determinants of labour emigration for the considered panel countries, the emigration flows being largely shaped compared to associated costs. Nevertheless, losing the job and assimilated wage, reflected by an increase in the unemployment rate, a generalised increase in prices, reflected by an increase in the inflation rate, as well as the deterioration of the gender pay gap, living conditions and population health, implies the reduction of migrant's capacity to move and live in another country, thus significantly reducing emigration flows from the sending countries analysed within the panel towards the main destination countries in the European Union. On the other hand, a considerable improvement of the living conditions, reflected through an increase in GDP per capita, along with an increase of the life expectancy, could increase immigration flows, mainly due to a larger availability of financial resources needed in order to accomplish the process.

At the same time, the results highlight the main aspects of the *macroeconomic neoclassical theory*, pointing out that labour markets represent the most important mechanism through which international labour flows are induced. Also, the selection process described by Borjas (1989) is revealed by the results obtained after we introduced a new variable within the model represented by the upper-secondary or tertiary educational level of migrants. The results show that there is a positive selection of migrants, respectively an increase in highly skilled emigration flows, along with a significant reduction of this type of flows as the level of education increases for the entire population of sending countries. This is mainly due to an improvement in employment opportunities within these countries, by taking into account the fact that unemployment rate is extremely high for the population with primary and lower-secondary education.

The main limitation of the performed research is represented by the lack of comparable data concerning international labour migration, at a global level

and especially within the European Union. Concurrently, the research results have lead to identifying new opportunities and future research guidelines, through expanding the analysis of the labour emigration determinants and by analysing the economic consequences of the process, as well as the impact on labour markets in sending countries.

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