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INTERNATIONAL MIGRATION AND EDUCATION: A CENTRAL AND EASTERN EUROPEAN PERSPECTIVE

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The research aims to analyze the role played by the human capital investment in shaping international migration trends and influencing socio-economic development for the EU New Member States during the last decade. Our analysis is based on developing double-log macro-econometric models that combine cross-sections and time series in a panel structure, by using a set of indicators specific for the migration process, as well as for the economic activity, labour market and education, as main explanatory variables. Furthermore, the study focuses on a comparative approach for New Member States, our random and fixed effects models using several quantitative and qualitative proxies in order to highlight the relationship and interdependence between emigration, education and socio-economic development. The results show 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. To this respect, an increase in the number of persons with upper-secondary or tertiary education, especially women, has a major impact on shaping international migration flows, particularly for Central and Eastern European economies.

Keywords: Education, International Migration, Labour Market, Economic Development

JEL Classification: J01, J08, O15.

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1. Introduction

International labour migration is seen as a challenge in Europe, especially concerning the unskilled labour (Zimmermann, 2005). At the same time, human capital, respectively the tertiary educated 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 educational system (Borjas, 1987). Thus, developing countries become extremely competitive in providing skilled labour to cover this gap. Numerous studies have pointed out that labour migration is the result derived from inequality and/or wage differences between migrant sending and destination countries at various educational levels, these gaps being generated by socio-economic characteristics (Stark, 1984; Heilbrunn et al., 1995; Brixiova et al., 2009). 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 (European Commission, 2008). Moreover, structural changes of the political European economy have a significant impact on international migration policies and strategies (Menz & Caviedes, 2010). 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 (Dobson, 2009; De Giorgi & Pellizzari, 2009).

The process of labour emigration within the European Union encountered increasing trends during the last decade. 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). 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 or origin, as citizens of the European Union (Menz & Caviedes, 2010, p. 129). At the same time, Romania has one of the smallest share of secondary and tertiary educated labour, followed by Bulgaria, Hungary, Czech Republic or Poland, even though the number of graduates has increased in the last decade, while the literacy degree continuous continues to be a problem.

Males and females have equal shares in migrant flows from the eight EU New Member States since 2004, while females have a larger share in the case of Romanian and Bulgarian migrants, especially due to a significant demand for domestic workers from these countries within the EU-15. At the same time, migrant workers from Central and Eastern Europe hold jobs in industry, constructions or personal assistance, that are placed at the bottom of the occupational
hierarchy, with more than 35% of the migrants holding these types of low skilled jobs (European Commission, 2008, p. 130). The statistics point out that there is a positive selection of emigrants from the New Member States of the European Union according to their educational level (Brucker et al., 2009, p. 92), so that the higher wage obtained in the host country was adopted along with a decline in the social status.

Figure 1 Estimations of the emigrant stocks (left, persons) and education (right, %) for selected Central and Eastern European migrant sending countries, 2010
Source: own processing of panel data through Stata 11 econometric package.

Taking into consideration all these aspects, the paper is structured into three main parts: the theoretical background on highly skilled labour emigration is presented at the beginning of the paper after a brief introduction, followed by the methodology in the second section of the paper, while the main findings, discussions and concluding remarks complete the paper in its final part.

2. Highly Skilled Labour Emigration Literature Review

The economic literature concerning the international labour migration impact on sending and receiving countries focuses on the immigration effects on natives, especially in terms of unemployment, job choices and wages (Borjas, 1989; Zimmermann, 2005). Nevertheless, the analysis of effects generated by the loss of one part of the labour force, especially highly skilled labour, upon Central and Eastern European sending economies and labour markets is not so common in the literature.

For the country of origin, the emigration of one part of its labour force has two major implications (Sjaastad, 1962; Theodossiou & Zangelidis, 2009): (i) first, the emigration process modifies the size and structure (education, skills) of the labour force; (ii) second, emigration, through
remittances, affects consumption and investment in the source economy, generating at the same time significant positive effects upon economic growth and poverty reduction. This tendency is extremely important within our empirical analysis, due to the fact that, especially for Romania, the GDP per capita is quite low comparative to the other Member States, being associated with a very high level of income inequality, while remittances have registered the largest amount among other receiving countries.

Figure 2 Estimations of the GDP per capita (left, US$), Income Inequality (middle, Gini index) and Remittances (right, mil. US$) for Selected Central and Eastern European Migrant Sending Countries, 2010

Source: own processing of panel data through Stata 11 econometric package.

On these lines, economic growth and international labour migration relationship analysis takes into account the direct and indirect emigration effects. The main direct effect is represented by the remittances contribution to national income, while the indirect effects refer to production changes due to labour losses, changes in the educational level and to the remittances impact on internal savings and investments.

Following the perspective of a developing migrant sending country, the emigration of a certain part of its population, like the highly skilled labour, can determine a productivity reduction for the other workers, this particular effect reducing the overall welfare gains from emigration (Clemens, 2011, p. 89). However, the conditions that would lead highly skilled labour emigration to result in a diminishing, at equilibrium, in the stock of sending country’s skilled workers, are not accurately determined by the literature. Mountford (1997) highlights that when emigration towards countries with higher wages is possible, then the expected value of human capital increases for all potential migrants, even if the process involves uncertainty and high costs. Thus, due to the fact that not all of those who were encouraged to invest in order to improve their skills will emigrate, the simple existence of this option could increase the human capital stock in the migrant sending countries.
Taking into consideration all these aspects, the main objective of the performed research is described by the macro-econometric analysis of the shaping factors of labour emigration within the main sending countries from Central and Eastern Europe, members of the European Union, focusing on the role played by education. In order to accomplish this objective, the research is based on developing macro-econometric 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. Developed Models: Equations, Specifications, Hypotheses and Testing

In order to analyze the relationship between labour emigration, human capital investment and socio-economic development for migrant sending countries, New Member States of the European Union, we developed and tested macro-econometric models, which combine cross-sections with time-series, using panel data during 2000-2010 for a group of seven Central and Eastern 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 emigration 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).

The emigration data were 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, education and the labour market we used data series mainly from Eurostat and the World Bank.

General form of the model

The model developed for the analysis of the relationship between labour emigration and human capital investment, with a significant impact on sending country’s competitiveness, has the general form of a simple regression model with panel data. Thus, for panel data, the general linear representation of the model is described as follows (Baum, 2001, p. 219):

\[ y_{it} = \sum_{k=1}^{k} x_{kit} \beta_{k} + \epsilon_{it} \]  

where:

\[ i = 1, ..., N \]
\[ t = 1, ..., T \]

\( N \) represents the number of panel units (countries),
\( T \) signifies the number of periods (time).
This linear regression model is extremely useful for (i) the analysis of the dependence between variables, the labour market and human capital investment specific endogenous variable, respectively the exogenous variable specific for the emigration process, and (ii) for characterizing the dependence between the two variables in a certain time horizon (2000-2010).

The proposed model uses the logarithm of the variables in order to capture a precise estimation of parameters, respectively the influence of emigration process on labour force educational level, thus taking the general form of a double-log model.

At the same time, a dynamic analysis was performed by transforming the model into a dynamic model, which implies that the endogenous variable depends on present and past values (lags) of his, along with other explanatory variables.

To highlight the main shaping factors of the stock of emigrants we adopt the following specification:

\[
\log(EM_{it}) = \beta_0 + \beta_1 \log(EM_{it-2}) + \beta_2 \log(IRdef_{it}) + \beta_3 \log(UR_{it}) + \beta_4 \log(GDPcap_{it}) + \\
+ \beta_5 \log(PD_{it}) + \beta_6 \log(LE_{it}) + \beta_7 \log(IMR_{it}) + \beta_8 \log(INEQ_{it}) + \beta_9 \log(EDUC_{it}) + \\
+ \beta_{10} \log(TERTed_{it}) + \beta_{11} \log(WGs_{it}) + \epsilon_t
\]

where:
- \( EM \) = emigrant stock;
- \( EM_{it-2} \) = second lag of the emigrant stock;
- \( IRdef \) = inflation rate, GDP deflator;
- \( UR \) = unemployment rate;
- \( GDPcap \) = 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.

At the same time, for the analysis of the effects generated by the emigration process upon the labour market and education was performed through various models, with the following general configuration:

\[
\log(LMEDU_{it}) = \beta_0 + \beta_1 \log(IMMIGtot_{it}) + \beta_2 \log(GDPcap_{it}) + \beta_3 \log(WGs_{it}) + \epsilon_i
\]
where:

- \( LMEU \) = are the dependent variables specific to the educational level and labour market within our seven sending countries considered within the panel; these variables refer to the labour force with primary, secondary and tertiary education;
- \( IMMIGtot \) = the flows of immigrants by citizenship (emigrants according to the mirror data procedure), this independent variable is thus quantified in order to eliminate the potential bi-directional causality (endogeneity) that could occur between the stock of emigrants used in the previous model and the education level;
- \( GDPcap \) = gross domestic product per capita;
- \( WGs \) = monthly minimum wage; these last two independent variables are control variables introduced in order to better capture the emigration impact on education and the labour market.

A high level of precision is ensured for the developed models through validating the basic hypotheses of the regression models, as well as the robustness of parameters estimated through least squares and correlated panels corrected standard errors (PCSEs) methods, that are used for random (RE – random effects) and fixed (FE – fixed effects) effects models.

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 validity of random effects results was tested through Breusch-Pagan Lagrangian Multiplier test; the hypothesis of no serial correlation of the residuals was performed through the Wooldridge – Lagran Multiplier test; the homoscedasticity hypothesis was validated through the modified Wald test for group-wise heteroskedasticity 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 tests, 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 fixed effects model we used the OLS method (OLS – Ordinary Least Squares) and for the random effects model we used the GLS method (GLS – Generalized Least Squares). The GLS method was used because it is a specific estimation method for random effects models and produces feasible results without optimistic SE estimates, due to the fact that in our sample \( N \) (7 countries) is smaller than \( T \) (11 years). Nevertheless, to ensure the robustness of the results we used another estimation method respectively the correlated panels corrected standard errors (PCSEs) method. At the same time, to avoid any potential bi-directional causality between migration and education we used in the fourth model the TSLS-IV method. The main objective of the empirical regression analysis is to explain as much as possible from the variation of the dependent variable through the variation of the explanatory variables used within associated models.
Description and analysis of variables

In analyzing the process of labour emigration, respectively the role played by education in modelling this process for the considered Central and Eastern European countries, members of the European Union, we used as dependent variable the stock of emigrants. The time evolution of the dependent variable is reflected in Figure 3.

![Figure 3 Panel Evolution of the Dependent Variable, Specific to the Migration Process (Stock of Emigrants)](source)

*Source: Own preparation.*

Analyzing the graphical representation of specific migration indicators it can be observed that in the panel the time evolution of the stock of migrants has significant fluctuations from one country to another in the period 2000-2010 – a high level for Romania and Poland, the first country in the panel, facing an upward trend in the number of emigrants, respectively a balanced evolution, linear panel for other countries (Bulgaria, Czech Republic, Slovak Republic, Hungary and Lithuania). Romania and Poland can be easily identified within the panel, these two countries having a very large stock of emigrants (immigrants by citizenship) during 2000 - 2010, respectively a strongly negative crude rate of net migration.

![Figure 4 Panel Evolution of the Log Dependent Variables, Specific to the Migration Process (Stock of Emigrants, Flow of Immigrants by Citizenship)](source)

*Source: Own preparation.*
In processing the models that quantify the main shaping factors of the emigration process, focusing on education we used the logarithm of the dependent variable specific to the emigration process, respectively the stock of emigrants. Independent variables used are grouped according to the conceptual model, as follows:

(i) specific macroeconomic indicators (economic growth, macroeconomic stability): GDP per capita (U.S.$), real income per capita, inflation measured by the GDP deflator (annual% change).

(ii) labour market indicators: unemployment rate - total, primary, secondary and tertiary.

(iii) demographic indicators (social, health, quality of life): population density, life expectancy at birth, infant mortality rate.

(iv) indicators on wages (earnings / revenues): monthly minimum wage, wage inequality (Gini Coefficient).

(v) indicators of education - educational level: persons with upper secondary or tertiary education as a share of total population / labour force, the ratio of female to male enrollment in tertiary education.

These variables capture the specific elements of the economic activity, employment and education levels of the population, combined with demographic issues. Databases used to collect time series variables associated with each of the countries in the panel are the World Bank Database, Eurostat Statistics Database, International Labor Organization, UNECE (United Nations Economic Commission for Europe) Division Statistical Database, UNU WIDER World Income Inequality Database (United Nations University, World Institute for Development Economics Research). Descriptive statistics of all the variables included in our developed models are presented in Appendix.

We expect the time lags of the stock of emigrants to be positive and extremely significant (at 0.1% level), thus confirming the importance of migrant networks in increasing the number of emigrants, this being the main reason for choosing the second time-lag of the stock of emigrants due to the fact that we consider that. At the same time, we expect the coefficient associated with the unemployment rate to be positive, a deterioration in labour market conditions due to high unemployment thus representing an additional incentive/ motive towards emigration. The coefficients associated with the educational level are expected to be positive thus proving the hypothesis of positive selection of migrants at education according to their educational level, as mentioned also by Borjas (1987).

For the second set of models developed in order to analyze the emigration impact on the labour market by educational level within migrant sending economies we used as independent variable the flows of immigrants by citizenship and two other control variables, respectively the GDP per capita and monthly minimum wage. The dependent variable is represented alternatively be
three indicators, the labour force with primary, secondary and tertiary education, selected for the labour market and education impacts. We expect that the emigration process to have a negative impact on the labour market in sending countries highlighted through the loss of one part of the labour force, especially highly skilled labour (a negative sign for the associated coefficient). At the same time, the emigration process is expected to have a positive impact on educational level within source economies, through additional investment made in education, especially upper-secondary or tertiary education due to significant opportunities offered at destination for highly skilled labour. Still, the literacy degree is quite low for the considered panel countries from Central and Eastern Europe, mainly due to an increasing dropout rate.

The testing of variables was conducted before using them in the developed models, particularly to ensure the accuracy of fixed effects models - FE, that require only the use of time-varying characteristics of each unit in the panel. For this target, we processed and used descriptive statistical analysis of explanatory variables. Emphasis was placed on the analysis of standard deviation within panel units, mainly because the coefficients of variables with a low standard deviation were not properly estimated by the OLS method and variables with a zero standard deviation must be disposed of FE models, due time invariance.

4. Main Findings and Discussions

Based on our specific methodology, we developed various regression models with cross-section and time series combined on panel data, using random effects (RE) (model 2) through least squares method (GLS – Generalized Least Squares). At the same time, we processed our developed models based on the fixed effects (FE) method (model 1) and the Hausman test applied in order to choose between the two categories of parameters has validated the results of the random effects models. At the same time, the Breusch-Pagan test for random effects was in favour of these results. Nevertheless, for a proper estimation of parameters and robustness of results, we processed the models through other estimation methods, respectively the linear regression, correlated panels corrected standard errors (PCSEs) method (model 3) and TSLS-IV method (model 4).

The models have been tested and assessed based on their validated hypotheses, generating accurate conclusions adequate for identifying and analyzing the impact of the emigration process on human capital investment and competitiveness for considered countries assessed within the panel.

As a first step of our empirical analysis, we tried to capture the role played by education in shaping international migration trends, along with other socio-economic and demographic explanatory variables, and only afterwards, to see how migration influences the educational level and trough it affects socio-economic development. Thus, we developed a dynamic multiple regression model with panel data that uses the second time lag of dependent variable as explanatory variable mainly for highlighting the role played by migrant networks, processed through fixed and random effects, PCSEs and TSLS-IV methods. The main results were presented in Table 1 (without being significant differences between the results obtained after processing the model with these three different estimation methods).
Table 1  
Results of Dynamic Double-Log Models with the Stock of Emigrants as Dependent Variable

| Dependent variable: Stock of emigrants | Model 1  
| OLS FE b/se | Model 2  
| GLS RE b/se | Model 3  
| PCSE b/se | Model 4  
| TSLS-IV b/se |
|----------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Two lags Log Emigrants                  | 0.397** (0.12)                  | 0.889*** (0.05)                 | 0.889*** (0.06)                 | 0.889*** (0.05)                  |
| Log Inflation Rate                      | 0.008 (0.02)                   | 0.025 (0.02)                   | 0.025 (0.02)                   | 0.025 (0.02)                   |
| Log Unemployment Rate                   | -0.170 (0.13)                  | -0.224** (0.07)                | -0.224** (0.08)                | -0.224** (0.07)                |
| Log GDP per capita                      | -0.036 (0.18)                  | 0.009 (0.12)                   | 0.009 (0.14)                   | 0.009 (0.12)                   |
| Log Population density                 | 1.381 (3.66)                   | 0.671*** (0.15)                | 0.671*** (0.15)                | 0.671*** (0.15)                |
| Log Life expectancy                    | -5.414 (6.13)                 | 0.526 (3.02)                   | 0.526 (3.02)                   | 0.526 (3.02)                   |
| Log Infant mortality rate              | -1.111 (0.20)                  | 0.391* (0.20)                  | 0.391* (0.22)                  | 0.391* (0.20)                  |
| Log Inequality – Gini                  | 0.320 (0.31)                   | 0.596* (0.30)                  | 0.596* (0.33)                  | 0.596* (0.30)                  |
| Log Education                          | -0.0128 (1.56)                | 2.788*** (0.64)                | 2.788*** (0.51)                | 2.788*** (0.64)                |
| Log Female–male tertiary educ          | 0.799 (0.44)                   | 1.255*** (0.31)                | 1.255*** (0.27)                | 1.255*** (0.31)                |
| Log Minimum wage                       | 0.307 (0.32)                   | -0.439* (0.21)                 | -0.439* (0.23)                 | -0.439* (0.21)                 |
| Constant                               | 21.464 (25.88)                 | 22.079 (13.30)                 | 22.079 (13.37)                 | 22.079 (13.30)                 |
| R-squared                              | 0.94                           | 0.98                           | 0.98                           | 0.98                           |
| F-test                                 | 62.58***                      | 3745.72***                     | 17336.85***                    | 340.52***                      |
| Wald χ²                                |                                | 3745.72***                     | 17336.85***                    |                                |
| Modified Wald test for heteroskedasticity | 8.33                         |                                |                                |                                |
| Wooldridge test                        | 17.38*                         | 37.38***                       |                                |                                |
| Breusch-Pagan LM test                  |                                | 2.10                           |                                |                                |
| Hausman test                           | 3.54                           |                                |                                |                                |
| N observations                         | 61                            | 61                             | 61                             | 61                             |

Note: * p<0.05, ** p<0.01, *** p<0.001. The standard errors are presented in brackets; the models are estimated through fixed effects (model 1), random effects (model 2), PCSEs (model 3), TSLS-IV (model 4) for each country within the panel and comprise a time dummy variable.

Source: Own preparation.

The estimated RE coefficients highlight that there is evidence to attest that unemployment, education, wages and socio-demographic indicators have a major influence on shaping emigration trends for the considered Central and Eastern European economies. Still, the negative sign of unemployment rate is contrary to expectations (Agbola & Acupan, 2010), a possible explanation for...
this could be the fact that, for our panel considered countries, the loss of a job and the associated income reduces the number of emigrants, mainly due to the lack of financial capacity to move and establish into another country, taking into consideration the fact that the unemployment rate is very high for primary and lower-secondary educated labour, while a slight increase in the monthly minimum wage can’t cover this difficulty due to the fact that its level, as well as the general wage level, is extremely low for the considered countries analyzed within the panel, compared to other EU Member States.

An improvement in the origin country’s educational level, respectively the increase in the number of persons with upper secondary or tertiary education, especially for females, has a major impact on shaping international migration trends. This is the main reason for choosing the female to male tertiary education ratio as explanatory variable that captures the importance of migrant selection process and potential gender differences in emigration stocks. The positive selection of migrants at destination, according to their skills and educational level is also pointed out by the obtained results.

The emigration process leads to positive effects on the educational level of sending country’s population, through its improvement towards upper-secondary and tertiary education. At the same time, the emigrant stock increase can have negative consequences on education, highlighted by the slight increase in the number of early school leavers.

**Figure 5** Panel Trends of the Labour Force by Educational Level – Primary, Secondary, Tertiary, 2000-2010

*Source: Own preparation.*
Conclusively, as pointed out by the literature, the positive impact of emigration on the labour market, displayed through a slight increase in employment and unemployment reduction, is countered by the significant negative effects on the size and structure of the labour force, respectively on gender labour force participation rates. Taking into consideration the results of previous models and the guidelines of international migration theories concerning the positive selection of tertiary educated migrants (also highlighted by the previous empirical analysis), we could observe that the emigration impact on labour force among tertiary educated persons within the origin country is negative. According to the R-squared, the emigration process largely explains the variation of the highly skilled labour, the emigration stock justifying about 25% in its variation.

The graphical representation of the labour force trends by educational level within the panel during 2000-2010 highlights a significant reduction in the size of primary educated labour, large discrepancies being manifested in the case of Czech Republic and Slovak Republic. Secondary educated labour force registered a slight increase during this period for all seven countries analyzed within the panel, while significant perturbations are revealed in the case of tertiary educated labour.

For this purpose, we analyzed the impact of the emigration process on the size and structure of the labour force, by developing three double-log regression models that use the flows of immigrants by citizenship as main exogenous variable, along with two other control variables (GDP per capita and monthly minimum wage), respectively the primary (model 1), secondary (model 2) and tertiary (model 3) educated labour force as endogenous variables.

### Table 2
Results of developed models based on the logarithm of the flows of immigrants by citizenship for the analysis of emigration impact on the labour force size by educational level, PCSEs method

<table>
<thead>
<tr>
<th></th>
<th>Model 1 b/se</th>
<th>Model 2 b/se</th>
<th>Model 3 b/se</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Immigrants</td>
<td>2.637***</td>
<td>1.667*</td>
<td>-4.490***</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.72)</td>
<td>(0.81)</td>
</tr>
<tr>
<td>Log GDP capita</td>
<td>-3.933***</td>
<td>9.306*</td>
<td>-5.412</td>
</tr>
<tr>
<td></td>
<td>(0.84)</td>
<td>(3.63)</td>
<td>(3.91)</td>
</tr>
<tr>
<td>Log Min wage</td>
<td>-6.822***</td>
<td>3.216</td>
<td>4.079</td>
</tr>
<tr>
<td></td>
<td>(0.98)</td>
<td>(3.28)</td>
<td>(3.59)</td>
</tr>
<tr>
<td>Constant</td>
<td>57.988***</td>
<td>-53.034**</td>
<td>94.774***</td>
</tr>
<tr>
<td></td>
<td>(3.28)</td>
<td>(18.84)</td>
<td>(18.71)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.820</td>
<td>0.422</td>
<td>0.255</td>
</tr>
<tr>
<td>Wald χ²</td>
<td>1433.62***</td>
<td>193.18***</td>
<td>35.94***</td>
</tr>
<tr>
<td>N observations</td>
<td>77</td>
<td>77</td>
<td>77</td>
</tr>
</tbody>
</table>

*Note: * p<0.05, ** p<0.01, *** p<0.001. The standard errors are presented in brackets; the models are estimated through PCSEs method for each country within the panel and comprise a time dummy variable.

**Source:** Own preparation.

The results obtained after processing the third model point out that emigration contributes to the significant reduction of the tertiary educated labour force within the source country, of which
variation could be largely explained through the variations in the number of emigrants, according to the R-squared (82.0%). The Wald test confirms that the explanatory variables are jointly significant in influencing the size and structure of the labour force, according to its educational level.

The loss of an important part of tertiary educated labour force has major negative implications on long term economic development for migrant sending countries, as pointed out by the model 3 results and by previous studies (Taylor, 2006; Agbola & Acupan, 2010). Nevertheless, the GDP per capita decrease could represent an additional motive for emigration, the highly skilled labour being drawn by significant opportunities offered at destination, while the slight increase in monthly minimum wage is not significant in conserving this part of the labour force. Still, a differentiated improvement in employment opportunities in the source economy represents a positive effect of emigration, mainly for the unskilled labour.

The results obtained after processing the second model show an increase in the secondary educated labour force due to emigration. At the same time, the variation of this particular labour market indicator for the origin country can be explained in proportion of 42.2% through the variations in the flows of immigrants, along with the other two control variables. Still, as mentioned before, the major emigration impact is revealed in the case of tertiary educated labour, an increase of the migration process leading to a significant reduction of highly skilled labour, with major implications on host economies.

As a general appreciation, due to a significant reduction of the tertiary educated labour force, the non-migrants, respectively the persons that remain in the source country, make additional investment in education, thus improving their employment perspectives, so that labour emigration could determine an increase in the number of labour force with primary and secondary education and an implicit reduction of the unemployment rate.

5. Concluding Remarks

The results reveal that unemployment, education, wages and socio-demographic indicators have a major influence on shaping emigration trends for the considered Central and Eastern European economies, as well as a significant impact of emigration on the size and structure of the labour force according to its educational level. Thus, the emigration process generates a reduction of the highly skilled labour force in the case of the seven migrant sending countries analyzed within the panel and various changes in its structure, through improving the educational level from primary to upper-secondary education. As a result, the loss of a significant part of highly skilled labour (tertiary educated) induces medium and long term negative economic consequences on migrant sending economies, slowing down the technological progress, innovation and GDP per capita growth rate, issues that should be considered by the policy makers. The main hypotheses concerning the educational level of sending country’s population and the direct link to the emigration process highlight that its increase towards secondary education reduces labour emigration. This is due to an improvement in employment perspectives for persons with primary and lower-secondary education from the countries analyzed within the panel, that are facing high unemployment, as well as to a
higher tendency towards emigration in the case of tertiary educated labour force, following the positive migrant selection at destination. 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, unemployment rate, minimum wage and the size of the labour force being some of the most important factors in the context of international migration decisions. Migration trends are also modelled by other factors, such as the socio-economic and demographic ones, as highlighted by the results. 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 by taking into account the fact that the 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 highly skilled labour emigration determinants and by analyzing the economic consequences of the process, as well as its labour market impacts.

References


## APPENDIX

### Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min.</th>
<th>Max.</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock of emigrants</td>
<td>369489.40</td>
<td>500594.30</td>
<td>24154.00</td>
<td>2049272.00</td>
<td>77</td>
</tr>
<tr>
<td>Flows of immigrants - total</td>
<td>71400.58</td>
<td>96043.71</td>
<td>3455.00</td>
<td>539839.00</td>
<td>77</td>
</tr>
<tr>
<td>Flows of immigrants - female</td>
<td>31256.53</td>
<td>43403.03</td>
<td>2245.00</td>
<td>261195.00</td>
<td>77</td>
</tr>
<tr>
<td>Flows of immigrants - male</td>
<td>38395.99</td>
<td>51591.56</td>
<td>1137.00</td>
<td>276923.00</td>
<td>77</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>6.05</td>
<td>7.38</td>
<td>-3.71</td>
<td>14.25</td>
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<tr>
<td>Unemployment rate</td>
<td>10.64</td>
<td>4.72</td>
<td>4.30</td>
<td>19.94</td>
<td>77</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>8513.03</td>
<td>4694.40</td>
<td>1600.94</td>
<td>20728.86</td>
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<tr>
<td>Population density</td>
<td>100.53</td>
<td>26.93</td>
<td>52.96</td>
<td>136.37</td>
<td>77</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>73.51</td>
<td>1.67</td>
<td>70.90</td>
<td>77.55</td>
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<tr>
<td>Infant mortality</td>
<td>9.13</td>
<td>4.59</td>
<td>3.10</td>
<td>22.40</td>
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<tr>
<td>Inequality (Gini index)</td>
<td>944.24</td>
<td>266.39</td>
<td>552.25</td>
<td>1505.44</td>
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</tr>
<tr>
<td>Education rate</td>
<td>75.39</td>
<td>6.35</td>
<td>64.00</td>
<td>85.60</td>
<td>77</td>
</tr>
<tr>
<td>Female to male tertiary education ratio</td>
<td>131.36</td>
<td>16.91</td>
<td>96.99</td>
<td>163.59</td>
<td>77</td>
</tr>
<tr>
<td>Monthly minimum wage</td>
<td>171.88</td>
<td>80.97</td>
<td>29.41</td>
<td>324.86</td>
<td>77</td>
</tr>
<tr>
<td>Labour force with primary education</td>
<td>16.69</td>
<td>7.63</td>
<td>6.90</td>
<td>34.00</td>
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<tr>
<td>Labour force with secondary education</td>
<td>63.20</td>
<td>12.12</td>
<td>36.70</td>
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<tr>
<td>Labour force with tertiary education</td>
<td>19.90</td>
<td>10.15</td>
<td>9.10</td>
<td>46.00</td>
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</tr>
</tbody>
</table>

Source: Own preparation.