

## Macroeconomic determinants of permanent emigration from Romania. A Bayesian approach

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**Abstract.** The aim of this research is to identify some macroeconomic determinants for permanent emigration from Romania, in order to alleviate the negative consequences of this phenomenon in the origin country of the emigrants. For identifying the most relevant macroeconomic factors explaining the growth in the number of emigrants, the stochastic search variable selection was applied for various acceptance probabilities. Low increases in real earnings and the growth in poverty headcount ratio at \$3.10 a day encouraged Romanian people to permanently leave the country in the period 1991-2014 in order to improve their life conditions. Moreover, the taxes on income, profit and capital also created considerable pressure. On the other hand, unemployment was not felt as a crucial problem for emigrants. The economic policies should focus on the solutions aimed specifically at diminishing poverty.

Received:  
December, 2015  
1st Revision:  
January, 2016  
Accepted:  
May, 2016

DOI:  
10.14254/2071-  
8330.2016/9-2/13

**Keywords:** emigration, poverty, earnings, stochastic search variable selection

**JEL Classification:** C40, C51, J68

### INTRODUCTION

Causes and consequences of migration have been studied by a large variety of researchers from social, economic, demographic, politic, ethnic or cultural perspectives (Mihi-Ramírez, 2013; Lodewyckx et al., 2010; Čajka et al., 2014; Bilan, 2014). The effects of migration were studied from the theoretical and empirical points of view. There are both positive and negative effects of emigration on the economy and society in origin countries and also in destination (host) countries. In this context, suitable policies should be implemented in order to minimize the negative effects and amplify the positive ones.

Some positive effects of emigration in origin country are: remittances that might be used for consumption or for investment with potential effects on economic growth and standard of living, better labour productivity in case of temporary emigration, lower unemployment rate, less tensions on labour market which bring less social protection expenses. In the long run, this last effect might become a negative effect in terms of human capital deficit leading to the import of labour force. Negative effects might be related to roles change in family, children abandoning, underinvestment in education made by origin country.

In this research, the causes of emigration from Romania will be identified by using empirical analysis of macroeconomic variables. Actually, the objective of the paper is to figure out a profile of emigrants based on available national data. This approach is a novelty for the literature in domain in terms of data, being an alternative to the previous approaches that are based on survey data where emigrants in a certain country are analyzed and the sample might not be representative. On the other hand, there is also a methodological novelty for this research domain, the Bayesian approach being employed to select the determinants on small set of data due to missing values. The main results indicate that poverty and slow increases in real earnings were the main factors influencing the emigration from Romania during 1991-2014.

After this introduction, the paper continues with a short literature review that is followed by the presentation of methodology and main empirical results. The last part concludes.

## LITERATURE REVIEW

According to Keynesian economic theory, the supply on labour market is correlated to nominal, but also to real salary. In this context, emigrants go in the regions with better nominal wages (Jennissen, 2007).

The neoclassical economic theory admits differences in salaries between countries or regions that determine people to move from regions with high unemployment and low salaries to those with low unemployment and high salaries (Gazda, Puziak, 2013; Woźniak-Jęchorek, 2015). "The new economics of migration", an extension of neoclassical theory, consider families, households or other groups of people as unit of analysis instead of markets. The scope of these units of analysis is to reduce risk at minimum and to have the highest income as possible. In this context, one or more people from family emigrate in order to grow the total income of the family while other members remain to gain lower, but stable incomes. In terms of human capital investment, neoclassical theory considers that a person will emigrate if the expected income in another country will exceed the costs.

Contrary to neoclassical theory, the search theory considered the people emigration after they found a job in the destination country (Jennissen, 2007). In this approach, two stages are considered: the evaluation of migration costs and potential advantages and, on the other hand, the assessment of the particular job.

The theory of rejection factors explained the migration by the unfavorable conditions in the origin country. Among the rejection factors that generate emigration, we might consider low incomes, high unemployment, political instability, climatic conditions, ethnical and religious conflicts (Ailenei et al., 2015).

According to the theory of social networks, there are functional networks for large migration that encourage this phenomenon. These networks are based on interpersonal relations between origin population and destination one.

The theory of Tiebout (1956) considers that people are free to move in the country they want by taking into account the information about location. People search for a maximal individual utility in conditions of best public services.

The first econometric models for explaining migration consider as main cause of migration the salary differentials across countries generated by heterogeneous degrees associated to labour market tightness. This model was developed by Todaro (1969) and Harris and Todaro (1970) considering as cause of migration the expected wage rather than current wage differentials. This approach is suitable for explaining internal migration in economies that are not well developed, but it has been extended to international migration. The forecasts using these simple models were successful, according to Bauer and Zimmermann (1999), who found in many studies that employment and salary differentials are relevant predictors of migration. However, some limits of the empirical results were observed to Harris-Todaro approach when predicting migrations from Greece, Spain, Portugal and A10 countries. The predictions based on this model overestimated

the migrations from these states. In this context, it is important to include in the model aspects regarding quality-of-life in the origin country. On the other hand, differences in law rules, human rights and political stability could also influence migration. The search of more lucrative and productive jobs is determined by the need of a better life standard, unemployment and wage differentials.

The empirical and theoretical studies regarding migration refer to topics regarding education investment with the aim of future migration, gain or loss of human capital, brain drain magnitude, remittances, and knowledge circulation. Some studies are dedicated to the migration determinants, but these factors are specific to each country. In Romania, the main determinants of migration are related to social and economic environment (the lack of political stability, few opportunities, high corruption, and economical decline) by comparison with developed countries that offer better living conditions, higher revenues, better education and a more stable political environment (Androniceanu & Ohanyan, 2016). On the other hand, there are also specific reasons for migration like: job dissatisfaction, high aspirations regarding career, a high spirit of adventure, friends or relatives that live abroad. In Romania, there is a high correlation between regional level of development and emigration rates. Contrary to expectations, the statistical data analysis showed that strongest emigration is not met in poor Romanian regions, but in the richest ones (Bucharest, Transylvania and Banat regions) (Goschin et al., 2013). One of the main cause of Romanian emigration remains the high gap between Romanian citizens real wages and those of the employees from Western Europe. The emigration contributed to the decrease in unemployment in Romania and reduced the labour market pressure. As a consequence of labour force decrease, the real salary should grow. According to Ciupureanu (2014), the emigration had a positive impact on population earnings during 1998-2002.

The migration phenomenon assessment in Romania is limited by the short official data, as the Romanian statistics are related only to permanent emigration. Data for temporary migration are taken from migration statistics of the principal destination countries for Romanian emigrants (Italy, Spain, Germany, USA, and Canada). More information comes from surveys in destination countries with large Romanian communities (for examples, the survey organized by Soros Foundation in 2006 and 2011). However, taken into account the available data, a correct picture of the emigration phenomenon in Romania can't be taken (Tompea, 2009) and in this study we will focus on the official data regarding permanent migration.

The current approaches regarding migration in Romanian literature are based on theoretical description of the phenomenon (Pociovălișteanu and Dobrescu, 2014, Glennie and Pennington, 2013, Pociovălișteanu and Badea, 2013), the presentation of evolution in time for some macroeconomic indicators (Andrén and Roman, 2014), Roman and Voicu, 2010, Frunză et al., 2008) and the empirical analysis of migration using econometric models. Most of the studies regarding migration determinants for Romania explained the emigration using econometric models. A cross-section model was employed by Prada et al. (2015) to explain the migration at county level in 2011 using the wage and labour conditions as explanatory variables. A gravity model was used by Balan et al. (2013) to explain the Romanian emigration during 1995-2010, but the lack of long data series made the conclusions less relevant. For all EU-27 states, Prada (2013) obtained that the net migration depended on GDP per capita and youth unemployment rate. For identifying the reasons for emigration in case of Romania, the data are based on surveys and traditional statistical models. Hinks and Davies (2015) used the data from Soros's survey made in August 2010 and employed some Probit models. The low expected wages and low investments in Romanian companies do not encourage emigrants to come back to their origin country. Ailenei, Cristescu and Hrebenciuc (2015) used data from a survey made in the period April-May 2011 for Romanian emigrants in Italy to build a Logit model. The higher wage as well as better conditions of life and work determined Romanian people to emigrate in Italy.

For maximizing the benefits of migration and diminishing its negative consequences, a mix of policies should be implemented, but these policies should encourage the sustainable development. On short-run, the

policies consist in administrative measures to support the labour force occupation agencies in controlling and directing the migrants for a better integration in the destination country. On medium and long run, the policies should consist in strategic interventions for redirecting the comparative advantages on labour market. On the other hand, these policies should support the economic growth and the maximization of positive effects of migration, among them being money transfer and technological impact. For reintegration of temporary migrants that come back to their origin country, the governments should use schemes for integration on labour market, mostly because those who benefited of high specialization abroad might not be compatible with the internal technological and managerial structures. The remittances might have different usages, but the investment is the best alternative for origin country of emigrants. Therefore, a favourable business environment and a functional labour market are necessary. The long term policies should be based on structural and macroeconomic policies for ensuring an equitable and efficient economic growth. For the society progress, migration should ensure a real economic growth. For attracting Romanian emigrants to come back, the medium and long run policies should take into account elements of social capital (family relationships), economic capital and concrete opportunities of engaging on Romanian labour market (Ailenei, Cristescu and Hrebenciuc, 2015).

## METHODOLOGY

Let us consider a multi-factorial regression model with an initial set of variables from which a Bayesian algorithm will select those with the highest influence on the dependent variable Y. In case of this model,  $X_1, X_2, \dots, X_p$  the initial p independent variables. Let suppose that the variables are registered at different time periods. The main aim is to choose a fewer number of independent variables ( $X_1^*, X_2^*, \dots, X_q^*$ ) that are necessary to build the best model with the following representation:

$$Y_t = X_{1t}^* \beta_1^* + X_{2t}^* \beta_2^* + \dots + X_{qt}^* \beta_q^* + e \quad (1)$$

$\beta_1^*, \beta_2^*, \dots, \beta_q^*$  – models' parameters  
 $X_1^*, X_2^*, \dots, X_q^*$  – exogenous variables  
 Y- dependent variable  
 e- error  
 t-index for time

Stochastic Search Variable Selection (SSVS) will be employed in this study to identify the most suitable variables that explain the dependent one. This procedure supposes the determination of a Bayesian hierarchical prior mixture (George and McCulloch, 1997). The mixture is employed in order to compute the posterior probability. The best model will be the one with the highest posterior probability. In this case it is not necessary the calculation of the probabilities corresponding to the  $2^p$  models. Gibbs sampling method is used in estimation for simulating the sample from posterior distribution. The advantage of this estimation method is the efficiency and fast simulation. In a short time, there are big chances to identify high probabilities.

A linear model is employed to put into evidence the relationship among endogenous variable and potential explanatory factors ( $X_1, X_2, \dots, X_p$ ):

$$f(Y | \beta, \sigma) = N_n(X\beta, \sigma^2 I) \quad (2)$$

X: nxp matrix

$$X = [X_1, X_2, \dots, X_p]$$

Y: nx1 matrix

$\beta$  : px1 parameters' vector

$\sigma$  : a positive unknown constant

Every possible subset of variables is indexed in a certain vector. Any subset of explanatory variables having small estimators is dropped.

$$\gamma = (\gamma_1, \dots, \gamma_p)' \tag{3}$$

$\gamma_i = 0$ , if  $\beta_i$  is small and  $\gamma_i = 1$ , if  $\beta_i$  is large enough

The chosen predictor is modeled using a prior mixture, where  $\gamma$  is unknown and  $q_\gamma$  ( $q_\gamma \equiv \gamma'1$ ) is the size of the  $\gamma$ -th sub-set:

$$\pi(\beta, \sigma, \gamma) = \pi(\beta / \sigma, \gamma) \pi(\sigma / \gamma) \pi(\gamma) \tag{4}$$

$\beta$  is seen as the prior realization having a multivariate normal distribution. The model for the  $\gamma$ -th subset is:

$$\pi\left(\frac{\beta}{\sigma}, \gamma\right) = N_p\left(0, \mathbb{N}_{(\sigma, \gamma)}\right) \tag{5}$$

The  $i$ -th element placed on the diagonal matrix  $\mathbb{N}_{(\sigma, \gamma)}$  is the best selection, the coefficient being 0 or 1. The residual variance  $\sigma^2$  for to the  $\gamma$ -th model represents the realization of an inverse gamma distribution for the prior:

$$\pi\left(\frac{\sigma^2}{\gamma}\right) = IG\left(\frac{\vartheta}{2}, \frac{\vartheta \tau_\gamma}{2}\right) \tag{6}$$

The last equation is equivalent to:

$$\frac{\vartheta \tau_\gamma}{\sigma^2} \sim hi_\vartheta^2 \tag{7}$$

While number of predictors in the subset increases, the value of  $\tau_\gamma$  should diminish.  $\tau_\gamma$  is the prior estimator for  $\sigma^2$  and  $\vartheta$  is the prior corresponding to sample size. In case of no information on  $\sigma^2$  prior, we consider  $\tau_\gamma \equiv s_{LS}^2$ , where  $s_{LS}^2$  is the OLS estimator for  $\sigma^2$ .  $\vartheta$  is chosen as to have a high probability for  $\pi(\sigma^2 / \gamma)$  on the interval  $(s_{LS}^2, s_Y^2)$ , where  $s_Y^2$  is the variance for Y.

In fact,  $\gamma$  can be seen as realization of any prior  $\pi(\gamma)$  from the  $2^p$  values of  $\gamma$  :

$$\pi(\gamma) = \prod w_i^{\gamma_i} (1 - w_i)^{(1-\gamma_i)} \tag{8}$$

$\pi(\gamma_i = 1) = 1 - \pi(\gamma_i = 0)$  is the probability that  $\beta_i$  is as large as to be chosen in the final model.

As data series for  $Y$  is known, the posterior distribution  $\pi(\gamma / Y)$  updates the prior probabilities corresponding to any  $\gamma$ . The prior hyper-parameters are chosen as to get high probabilities for  $\pi(\gamma / Y)$ .

In our application, the model has the following representation:

$$Y_i = \beta_i \cdot X_i + u_i, \quad u_i \rightarrow N(0, s^2) \quad (9)$$

$Y$ - dependent variable ( $n * 1$  vector)

$X$ - explanatory variables ( $n * k$  matrix)

$u_i$  - error

$s^2$  - error variance

$$\beta_i | \omega_i \rightarrow \omega_i \cdot N(0, V1) + (1 - \omega_i) \cdot N(0, V2), \quad V1 \setminus V2 \quad (10)$$

If  $\omega_i = 1$ , then a variable is selected in the model.

If  $\omega_i = 0$ , then  $\beta_i$  is closed to zero and the corresponding variable is excluded from the model.

Three levels are considered in the estimation algorithm.

First level:

$$\beta_i | \omega_i \rightarrow \omega_i \cdot N(0, V1) + (1 - \omega_i) \cdot N(0, V2) \quad (11)$$

$$s^2 \rightarrow IG(a, b) \quad (12)$$

Second level:

$$\omega_i | p_i \rightarrow \text{Bernoulli}(p_i) \quad (13)$$

Third level:

$$p_i \rightarrow \text{Beta}(a', b') \quad (14)$$

Conditional posteriors for  $p_i$  (acceptance probability),  $s^2$  and  $\beta_i$  have conjugate forms.

## RESULTS

As the main objective of the paper is to identify some macroeconomic determinants of emigration from Romania, several indicators were considered in the empirical study: number of permanent emigrants, real GDP rate (%), registered unemployment rate (%), occupation rate (%), remittances (% of GDP), taxes on income, profits and capital gains (% of revenue), index of real earnings and poverty headcount ratio at \$3.10 a day. The data for number of permanent emigrants, registered unemployment rate and occupation rate are taken from the database of National Institute of Statistics called Tempo-online. The data for the rest of the variables are provided by World Bank from the database called World Data Bank. The annual time series cover the period from 1991 to 2014.

Personal remittances consist in personal transfers and employees' compensation. Personal transfers include the current transfers that are received by resident households from nonresident ones. Employees' com-

pensation includes income of border, partial and any types of short-run workers in a non-resident economy or in a resident economy if they are employed by non-resident units.

Index of real earnings ( $I_{re}$ ) is computed as ratio between index of average nominal net earnings ( $I_{anne}$ ) and general index of consumer prices ( $I_{cp}$ ). The real earnings represent the value of goods and services that might be bought and used with the average net monthly earnings in a certain period compared to a reference period for certain prices of goods and tariffs of services. For Romania, the sources of data for this variable are: Statistical research regarding the labour cost in social and economic units and Statistical research regarding prices of consumer goods.

$$I_{re}_t = \frac{I_{anne}_t}{I_{pc}_t} \cdot 100 \tag{15}$$

$I_{re}$ : Index of real earning

$I_{anne}$ : index of average nominal net earnings

$I_{cp}$ : general index of consumer prices

t: index for time

The poverty headcount ratio at \$3.10 a day represents percentage of population using less than 3.10 dollars a day at 2011 international prices.

The number of permanent emigrants from Romania increased in 2014 compared to 1991 with almost 25.5%. The maximum number of permanent emigrants in this period (1991-2014) was registered in 1991 and it is explained by the political context. After the Revolution that brought communism fall in Romania, a large number of people leave the country permanently searching for better life conditions.

Stochastic Search Variable Selection (SSVS) was applied for more acceptance probabilities varying from 0.3 to 0.7. In the estimation algorithm, we consider 50 000 draws and 10 000 burn-ins. For an acceptance probability of 0.7, the Bayesian procedure did not identify any explanatory variable for the evolution in the number of emigrants. For an acceptance probability of 0.3, excepting unemployment rate, all the other variables were correlated with the number of emigrants. So, the permanent emigrants did not take into consideration too much the problem of unemployment in Romania when deciding to leave the country.

Table 1

The explanatory variables selected by stochastic searching algorithm

Probability of acceptance	Selected variables	Posterior mean for inclusion probability	Posterior mean for coefficient	Posterior standard deviation of coefficient
0.5	Occupation rate	0.58	1.013	3.174
	Taxes	0.536	0.34	3.159
	Index of real earnings	0.5	0.68	2.281
	Poverty headcount ratio at \$3.10 a day	0.538	0.213	3.156
0.6	Index of real earnings	0.734	1.433	3.179
	Poverty headcount ratio at \$3.10 a day	0.630	0.192	3.170

Source: author's calculations.

For an acceptance probability of 0.5, SSVS identified four variables (occupation rate, taxes on income, profits and capital gains, index of real earnings and poverty headcount ratio at \$3.10 a day) as determinants of emigration in Romania. The increases in taxes and poverty indicate a lower standard of life, which explains the growth in the number of emigrants from Romania. On the other hand, even if the occupation rate or the real earnings grew, the people continued to emigrate from Romania. At a first sight, the results seem to be contradictory. The occupation rate increased, as well as the salary, but for many people the wages offered in Romania were not still satisfactory. For some people, the increase in real wages was attracted and the occupation on labour market grew. However, the minimum wage in Romania is one of the lowest in the European Union, this country being over fulfilled only by Bulgaria.

For an acceptance probability of 0.6, SSVS identified only index of real earnings and poverty headcount ratio at \$3.10 a day as determinants of emigration in Romania. Indeed, the issues regarding poverty and the unsatisfactory increase in real earnings are among the main economical reasons for the population emigration in Romania. All details regarding results are presented in Appendix 1.

In this context, some economic policies should be implemented having as main objective the increase in standards of leaving by diminishing the poverty and ensuring an acceptable increase in real wages. On the other hand, the remittances should be use for investment in order to create better paid jobs.

This analysis did not include social factors regarding emigration, because of the lack of data. It is very likely that some people decided to leave without intention of coming back because of their aspirations regarding a better professional and social career, a better security, a more stable environment with less corruption. However, the economic factors seem to be more stringent, because they are related to the primary needs of people that condition the other expectations.

## CONCLUSIONS

In this paper, some macroeconomic determinants of permanent emigration from Romania were identified using a Bayesian algorithm that solves the problem of small sets of data with some missing values. As expected, the poverty and the small increases in real earnings determined Romanian people to go abroad. On the other hand, we should not neglect the high level of taxation on income, profit and capital gain. The tensions on labour market regarding the unemployment increase were not taken into account too much by emigrants when deciding to leave the country, even if the theoretical study considers the unemployment issue as capital in the CEE countries in the context of migration. In Romania, the poverty exerts more pressure on population than the issue of unemployment, even if the two indicators are correlated. Based on these empirical results, some recommendations should be done in terms of economic policies. The government should focus on medium and long run policies that diminish the poverty and ensure higher wages. This research is limited by the strict consideration of the economic factors in lack of variables that count for social and psychological factors which are not available at national level. On the other hand, data regarding temporary emigration are also important, but the national system of statistics did not measure the magnitude of this phenomenon. In this context, the only data might be collected thought surveys.

In a future research, it would be interesting to identify some macroeconomic determinants of emigration from Romania only in the period after the economic crisis start, because in this period the emigration phenomenon was more intense.

APPENDIX 1

acceptance probability= 0.6

regressors: real GDP rate (1), registered unemployment rate (2), occupation rate (3), remittances (4), taxes on income, profits and capital gains (5), index of real earnings (6) and poverty headcount ratio at \$3.10 a day (7)

----- All Candidate Regressors in the Model-----

Coef.	Post.mean	Post.std
C(0)	-0.019	2.341
C(1)	0.038	2.249
C(2)	0.052	2.056
C(3)	0.557	2.356
C(4)	0.029	1.965
C(5)	0.194	2.406
C(6)	1.063	2.782
C(7)	0.138	2.503
s^2	133390834.297	44603929.751

Variable Inclusion Probabilities

Coef.	Post.mean	Post.std
Tau(0)	0.553	0.497
Tau(1)	0.506	0.500
Tau(2)	0.422	0.494
Tau(3)	0.530	0.499
Tau(4)	0.391	0.488
Tau(5)	0.589	0.492
Tau(6)	0.734	0.442
Tau(7)	0.630	0.483

The regressors No. 6 7 are chosen in refined regression.

----- Refined Regression Model -----

Coef.	Post.mean	Post.std
C(0)	1.433	3.179
C(1)	0.192	3.170
s^2	133539858.060	44721652.929

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