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THE RELATIONSHIP BETWEEN WORKFORCE MIGRATION AND THE BASIC MACROECONOMIC VARIABLES OF THE COUNTRIES FROM CENTRAL EASTERN EUROPE WITH A FOCUS ON BULGARIA

In order to establish a relationship between the labor market and migration, we consider the following 11 countries: Bulgaria, Romania, Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Slovenia, Hungary, and Croatia. The explored period is 2000-2017. The following methodology is applied: namely VAR methodology. We prove that in Bulgaria, unlike other post-communist EU Member States, wage is the foremost factor governing the international migration of the labor force. The research reveals that foreign direct investments have a strong impact on labor productivity, wages, respectively on emigration and labor immigration. In our study we advocate a policy of accelerating income growth, combined by the introduction of a tax-deductible minimum.
JEL: G32; H20; H50

1. Introduction

We live in an era of increased globalization and integration where labor migration processes are considered to be natural movements, providing a free choice of residence, professional realization and lifestyle. High unemployment, economic crises, deepening inequality in Eastern European countries, and, on the other hand, the abolition of restrictions on crossing national borders, lead to a significant increase in emigration flows from the countries of Eastern Europe to those of Western Europe. Migration of the workforce, and in particular the emigration of young people, is seen as a serious problem, related to the reduction of employment and working population, deterioration of pension system parameters, shortage of qualified staff, etc.

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One of the paradoxes of Bulgarian labor migration is that regardless of the intensity of incoming and outcoming flows the relative share of refugees is very low. This is explained by both political and economic factors (see for details Cáritas Bulgaria, 2019). The latter problems, however, are outside the scope of the present study. Another particularity of the present paper is that we do not focus our research on the particular social and psychological factors that affect the decision to stay or leave Bulgaria, as in Mintchev and Boshnakov (2018), preferring to rely on macroeconomic interdependencies.

The analysis of the impact of emigration and immigration on the workforce and vice-versa, the relationship between these processes and the dynamics of the main parameters of the Bulgarian economy, is generally one-sided and beyond the context of analogous processes in the EU. Since 2007, Bulgaria has been part of an economic community in which free movement of labor is a fundamental principle. In addition, the European Union is surrounded by countries where salaries and incomes are typically lower than those prevailing inside the community. This creates a potential for emigration of workers to the core of the EU, given the persisting large difference in wages and incomes between Bulgaria and "old" Europe, as well as immigration to Bulgaria as an EU member state.

The aim of this paper is to explore the links between workforce migration and the basic parameters of the economic development of European countries as we emphasize on the migration processes of Bulgaria. Important task of the survey is to attempt to anticipate labor migration from and to Bulgaria and to justify adequate policies in the field of income, taxation, foreign investment, regulation of the labor market, etc. The methodological and theoretical basis of the research can be formulated in the following sequence: Theoretical analysis; Development and implementation of practical econometric models. The analysis which reflects the quantitative results of the application of econometric methodology is based on VAR methodology.

Restrictive conditions of this research are determined as follows:

Time range-this research is restricted in the time interval from 2000 – 2017. The explored period is heterogeneous because it includes pre-crisis, crisis and post-crisis period;

Methodological restrictions – they are set by the statistical properties of the researched data imposing the application of specific econometric tests and models, giving an opportunity for the reflection. The implemented methodology does not claim to be the only possible and applicable when inspecting and proving the research thesis of this study. Another methodological restriction is the implementation of data from different statistical sources (Eurostat and World Bank database). We should notify however that the most part of the data in the aforementioned statistical sources is grounded on the International Monetary Fund (IMF) methodology.

Space restrictions – the analysis and the inspection of the research are concentrated on specific markets from CEE.

Due to the aforementioned facts, conclusions drawn of this research do not engage the processes and circumstances of other markets of the category of European countries.

2. Literature Review

From the point of view of this study, it is particularly important to reveal the dependencies that exist between labor productivity and wages. This is because the comparative level of pay is a key motivating factor in terms of labor migration. On the other hand, in the long run, the comparative wage level depends on the labor productivity ratio between the country concerned and the other countries.

There are two approaches to the relationship between labor productivity and wages. According to neoclassical theory, wages ought to grow in proportion to labor productivity and expected inflation, so as not to increase unit production costs and reduce the competitiveness of the producers (Meager and Speckesser, 2011). The Alternative Keynesian approach, known as efficiency wage, postulates that companies are interested in paying a salary at equilibrium market level to increase productivity and reduce costs, with the best historical example being that of Henry Ford, with his salary of $5 a day (Bradley, 2007). Proceeding from these two concepts, suggesting different strategies at micro and macro levels, the study uses such econometric tools, and in particular vector autoregression, to test the validity of neoclassical and Neo-Keynesian hypotheses in the specific conditions of Bulgaria.

Taylor (1995) investigates the immigration processes in Argentina. He applies OLS regression model in order to reveal the relationship between immigration, workforce and GDP. The main conclusion is that the immigration inflow to Argentina raises the number of workforce during the period of study up to 43% and GDP to 19% respectively. Islam (2003) applies VAR model to expose relations between real wage, immigration and GDP in Canada. He concludes that immigrants in Canada not only satiate labor shortages, but create employment via boosting domestic demand. The research proves also that a 10% increase in immigrants will lead to a 1.6% decrease in local wages.

Feridun (2005) explores the causal relationship between immigration, unemployment and economic development in Norway using Granger causality tests and Johansen cointegration tests. He concludes that when the level of immigration rises, the GDP per inhabitant also increases. In his research, he proves that immigration has no impact on unemployment, and vice versa.

Glitz (2006) applies OLS regression in order to reveal the dependence of immigration on wage dynamics, population and employment of local residents in the host country. It is proved that for each ten immigrant who started working in Germany, four take the positions for local workers and others take up new jobs. In this way, immigrants displace local workers on the labor market and increase the unemployment of local residents. The study also identifies a negative impact of immigration on wages in the host country.

Kasnauskienė, Vėbraitė (2013) apply linear regression and structural VECM to investigate the interrelationship between immigration, wage, GDP and unemployment. Through the structural vector error correction model, they demonstrate that short-term immigration has a negative impact on the UK labor market as it reduces real wages and increases unemployment. Linear regression models prove that immigration has a negative impact on unemployment and real wages in the long run.

Fromentin (2013) examines the relationship between immigration, the labor market and economic development in France. Using a system of equations for unemployment, immigration, wage and gross domestic product, the estimation of a cointegration relationship between these variables shows that there is no observed increase in aggregate unemployment due to immigration in the long run. The vector error correction model indicates that immigration influences negatively unemployment and past immigration has a small impact on increasing wages in the short run. Despite institutional differences, migration flows have weak (positive) effects on employment in the long run in France.

There are many researches for the labor markets in the countries of CEE and their relations with migration flows. Ionescu (2014) explores 6 different Eastern European countries, namely Bulgaria, the Czech Republic, Hungary, Poland, Romania and the Slovak Republic. The explored period is 1980-2010. The results showed that Romania and Poland are the most affected by the emigration of the university-educated individuals, namely "the brain drain". The factors that were significant in determining emigration were the wages (influenced by GDP) in these countries, as well as the education expenditure (influenced by the inflation). It should be emphasized that Romania and Bulgaria experienced the highest total emigration rates in 2010. A positive aspect regarding the brain drain is the amount of remittances sent in the home countries. In the research is revealed that Bulgarian emigrants send the biggest amount of remittances. All of the 6 explored countries are faced with problems in the labor market, because the emigration of their highly skilled population is not compensated by a significant enough immigration of foreign population.

Giesing and Laurentsyeva (2016) implemented a panel research based on the construction of panel regression models by examining migration, investments, GDP and interest rate. They use data constructed as a firm-level panel of ten Eastern European countries, and prove that the "brain drain" of skilled workers reduces the overall performance of firms. They also reveal that most productive companies are more adjustable to emigration flows because they are able to retain and train their workers better.

Nika (2015) examined and evaluated the negative social consequences arising from the mobility of workers, the social and economic drivers of migration, and the effect of immigration on natives' labor market results such as wages and employment.The explored countries are from CEE: Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovakia. It is proved that cost of living is the most important driver of labor migration in all six CEE countries, followed by income opportunities, and unemployment rate. The freedom of circulation of workers and higher wages are basic pillars of economic incorporation in the EU: free mobility and better payment allow EU inhabitants to look for employment in any of the EU countries. It is proved the positive influence of emigration flows, namely sending nations to undergo short-term periods of high unemployment. In periods of economic crisis, labor circulation is a powerful source of comfort for crisis-stricken economies or areas.

Critescu, Stanila, Popescu and Vasilescu (2015) explore countries from CEE. For the purpose of the data analysis, they form two groups of countries, based on their history, background and recent development. The first group is (CE5): the Czech Republic, Hungary, Poland, Slovakia and Slovenia and the second one contains the Baltic and Balkan EU members (BB5): Bulgaria, Estonia, Latvia, Lithuania and Romania. They apply a panel

data model, in order to illustrate the influence of some essential macroeconomics indicators (unemployment rate, GDP, FDI) on the labor market (real average net earnings, employment rate). The explored period is 2000-2012. They conclude that the Central and Eastern European countries have functional labor markets which are a very important step in the establishment of the single European labor market. They consider that CEE countries need to pursue decisive economic policies. In order to accelerate their growth, the CEE should focus on a prudent macroeconomic policy that would shore up the confidence of financial markets. The key reforms for the CEE countries should, therefore, focus on incentives for labor mobility, more sustainable public finances, better adapted social security systems to demographic developments and harmonized regulations across borders.

Balkanska (2010) explores the relation between FDI and remittance by the Bulgarian labor migration on the economy. The research includes two sections: analysis of the FDI growth and their influence, the second part turns the focus on the Bulgarian emigration and the importance of remittances for overcoming the impoverishment of the Bulgarian population. In the research is proved that after the global financial crisis we observe lower FDI inflows. This leads to negative economic growth. Another important result of this research is the fact that the limited FDI inflows are aggravating the competitive struggle among the CEE countries in attracting FDI.

Baleva (2016) explores the contemporary challenges for the labor market in Bulgaria. According to the analysis of the research, the increasing imbalances between labor demand and supply highlight a number of inconsistencies in educational products and learners' training as well as the need for continuous development of professional skills and knowledge. The main conclusion is that investing in human capital and institutional provision of flexible systems for vocational training and retraining of the workforce is a primary task of the state and the relevant institutions, employers and individuals at the present stage of the development of the economy and society.

Mintchev, Kaltchev, Goev, and Boshnakov, (2004) estimate the emigration potential, as well as the profile of settlers and the temporary long-term and short-term Bulgarian emigrants. They discuss the difference between the actual emigration and the generally declared intention to travel abroad. They apply the questionnaire in 2001 and 2003 and econometric approach. There are used standard cross-tabulations and binary logit-models. It is important that: the immediate emigration potential from Bulgaria does not differ dramatically from that of the countries of Central Europe; age and previous stay abroad are among the most important determinants of emigration attitudes of Bulgarian citizens; employment, education and incomes do not have the expected influence. It is discussed that migratory policies, based on restrictions and bilateral agreements, could hardly be effective under the conditions of the newly created migration networks and the business which has found a niche in the provision of emigration services.

In an interesting study Zareva (2018) scrutinizes the effects of departure and of returning of Bulgarian migrants. The research, however, is based on a sociological representative opinion survey, and not on econometric investigation.

3. Data analysis and model specification

In this research, we explore data from eleven European countries: Bulgaria, Romania, Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Slovenia, Hungary and Croatia. The explored period is 2000-2017. It includes a phase of an economic boom, years in a global financial crisis and post-crisis recovery. We observe the dynamic of migration processes during these three phases in order to capture and take into account the impact of negative economic and political events that have an impact on the labor market. As a basis of the econometric analysis, the approach of Kasnauskienė and Vėbraitė (2013) was applied. These authors use a model that includes labor migration, unemployment, wages and GDP, based on a structured vector model with error correction and a linear regression model.

Unlike this research, our study includes additional variables such as labor productivity and foreign direct investment. In addition, our model uses emigration and immigration as separate variables. Another feature of the current study is the use of panel data involving all Eastern European EU member states. The purpose of these modifications is to take into account the impact of factors specific to Eastern European countries and Bulgaria in particular, and also to highlight the differences and similarities between the migration processes in our country and the other post-communist countries.

Among the advantages of panel data analysis is a large number of observations. This contributes to:

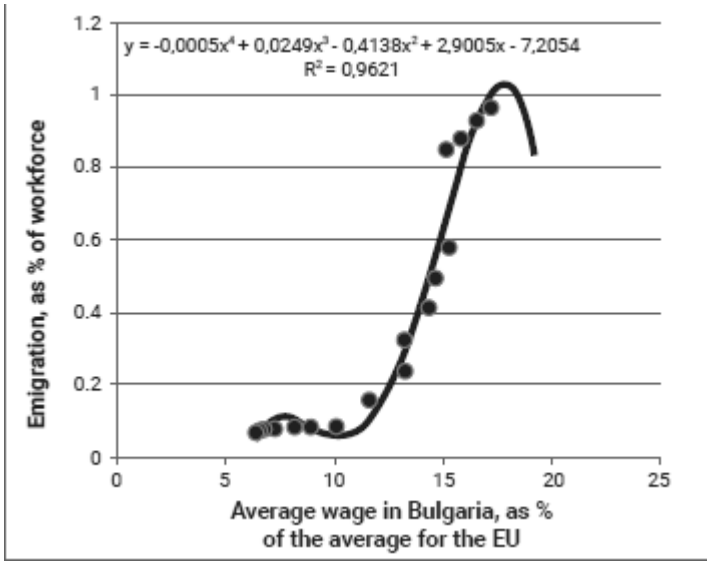
1. Provide opportunities for more accurate assessments and results, and minimize the number of standard errors;
2. Ability to solve the problem of omitted variables;
3. Ability to track an effect over time;
4. Ability to overcome the displacement problem caused by unobserved heterogeneity.

Before we proceed to a more systematic study of the processes related to the international labor migration in Bulgaria, we will pay attention to two important trends - the connection between emigration and the relative average wage in Bulgaria (Chart № 1) and the dependence between relative wage and foreign investment (Chart № 2). These links are important because the difference in labor cost is, by definition, the most important factor determining the international migration of workers and low wages have long been considered a major attraction for foreign investment.

Chart 1 shows emigration as a non-linear function of wages. As it can be seen, in the selected mathematical form (fourth-degree polynomial), after a certain level, the rise in wages leads to a reduction in emigration. When selecting another type of mathematical relationship, however, this effect may not occur. This means that more sophisticated econometric techniques are needed to explain the relationship between wages, emigration and other variables that reflect important processes in the economy.

Chart 1

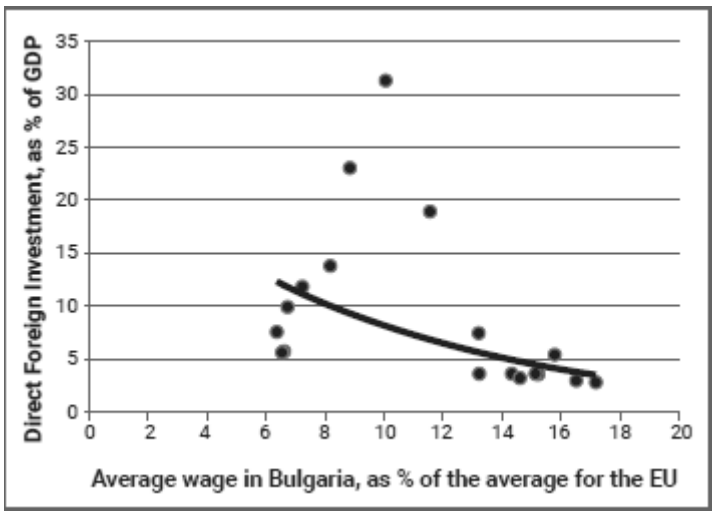
The connection between emigration and the relative average wage in Bulgaria



Source: Authors' calculations according to Eurostat data.

Chart 2

Dependence between relative wage and foreign investment



Source: Authors' calculations according to Eurostat data.

Chart 2 illustrates the relationship between direct foreign investment and relative wage. The relationship is negative, i.e. wage growth has a negative impact on investment, but with two peculiarities. First, the impact is relatively weak, and secondly, with an increase in pay, the impact on investment decreases. In other words, not so much the cost of the workforce, but increasingly the overall economic context, affects foreign investment.

The data used are from Eurostat and World Bank Database, with the missing values being generated by cubic spline interpolation (Table 1). The analyzed variables are macroeconomic, unlike the microeconomic approach used in other studies (see, for example, Giesing and Laurentsyeva, 2016). Unlike the present paper, in many cases, migration studies are limited to the impact on the wage and employment in the context of labor market (Gaston and Nelson, 2001). In the framework of the current study, the emphasis is on both the impact of migration on the main macroeconomic variables, including the labor market, and on the influence of macroeconomic processes on labor migration, on the other hand. The aim is to systematize direct and feedback links with a view of formulating recommendations for economic policy.

Table 1

Explored variables

Variable	Data source
GDP per capita	Eurostat
Unemployment rate	Eurostat
Immigration	Eurostat, Cubic spline interpolation
Emigration	Eurostat, cubic spline interpolation
Real Labor Productivity	Eurostat
Foreign Direct Investments	World Bank Database
Wage	World Bank Database, Cubic Spline Interpolation

Source: Authors' systematization.

From the point of view of the current study, it is of particular importance to reveal the dependencies that exist between labor productivity and wages. This is because the comparative level of pay is a fundamental motivating factor in terms of labor migration. For its part, in the long term, the relative wage level depends on the ratio of labor productivity between the respective country and other countries.

Another task of the survey is to attempt to anticipate labor migration from and to Bulgaria and to justify adequate policies in the field of income, taxation, foreign investment, regulation of the labour market, etc.

- **Augmented Dickey-Fuller (ADF) test and Panel Unit Root Test: Summary**

Before proceeding with the selection of the econometric method, it is necessary to apply a stationarity test. First, it is important to estimate the stationarity of the series, because it determines its conduct. Second, non-stationary data are not suitable for econometric modelling, because they give a spurious regression. Third, using non-stationary data in econometric modelling nullifies the standard assumptions of the asymptotic analysis (Kasnauskienė and Vėbraitė, 2013). In the current study we apply Panel Unit Root Test: we

give a summary of the panel for eleven European countries and Augmented Dickey-Fuller (ADF) test for exploring migration processes in Bulgaria.

The null hypothesis of the Augmented Dickey and Fuller (ADF) implies non-stationarity. The Augmented Dickey-Fuller unit root tests are completed for all series. The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the y series follows an AR (*p*) process and adding *p* lagged difference terms of the dependent variable y to the right-hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x_t^{'}\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + ... + \beta_p \Delta y_{t-p} + \nu_t \quad (1)$$

We apply ADF when we explore the migration process in Bulgaria. It is proved that they are integrated in a second order.

Panel unit root test is applied for the panel that includes 11 countries*: Bulgaria, Romania, Estonia, Latvia, Lithuania, Poland, the Czech Republic, Slovakia, Slovenia, Hungary and Croatia.* We establish stationarity at first difference data. We describe the panel unit root test by the following equation:

$$y_t = p_i y_{it-1} + x_{it}\delta_i + \varepsilon_{it} \quad (2)$$

Where i=1, 2…N cross- section units, which are observed over periods t=1.2…T_i; x_{it}- exogenous variables, including fixed effects or individual trends; p_i- autoregressive coefficient; ε_{it}- errors, which are assumed to be mutually independent idiosyncratic disturbance.

We may conclude that:

1. If $|p_i| < 1, y_t$ is considered to be trend stationary;
2. If $|p_i| = 1, then\ y_t$ contains a unit root. The null hypothesis assumes a common unit root process.

- **Model Specification**

In order to reveal the interactions between the explored variables, we apply the following models:

$$IM_t = f(U_t, W_t, Y_t) \quad (3)$$

$$U_t = f(IM_t, W_t, Y_t, PR_t) \quad (4)$$

$$W_t = f(IM_t, U_t, Y_t, PR_t) \quad (5)$$

$$Y_t = f(IM_t, W_t, U_t, PR_t) \quad (6)$$

$$PR_t = f(W_t, Y_t, FL_t) \quad (7)$$

$$EM_t = f(U_t, W_t, Y_t) \quad (8)$$

$$U_t = f(EM_t, W_t, Y_t, PR_t) \quad (9)$$

$$W_t = f(EM_t, U_t, Y_t, PR_t) \quad (10)$$

$$Y_t = f(EM_t, W_t, U_t, PR_t) \quad (11)$$

Where

IM_t/EM_t is immigration/emigration at moment *t* as a share of the working population aged 20-64;

W_t represents wage as a share of the average wage in the EU;

U_t - the level of unemployment; Y_t - GDP per capita;

PR_t- labor productivity, i.e. added value or GDP per employee;

FI_t - are direct foreign investments as a percentage of GDP.

The finalized theoretical model takes the following form:

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bx_t + \varepsilon_t \quad (12)$$

where y_t is a *k* vector of endogenous variables, x_t is a*d* vector of exogenous variables, $A_1,...,A_p$ and *B* are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. The vector autoregression (VAR) is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. It estimates the contemporaneous relationship between the variables, but VAR methodology is a procedure that gives useful insights for lagged links. The VAR approach sidesteps the need for structural modeling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system.

4. Results and Discussion

In this section of the research, we expose the results from VAR model. First, we explain the results for the eleven European countries from VAR regression. Second, we describe the significant relations for the labor market in Bulgaria.

- **Panel survey of the migration of the workforce in Eastern Europe**

A detailed panel study of the relationship between the underlying macroeconomic indicators of countries in Eastern Europe and emigration is presented in Table 2. The

purpose of panel research is to highlight trends and patterns typical of countries as a group. The main target variable is the emigration of the labor force, measured as a proportion of the working population. It turns out that emigration is subject to statistically significant impact of the following variables: unemployment, gross domestic product, wages and labor productivity.

Table 2

Results from VAR model for Panel data. The observed process is emigration

	DUNEMPL	DEMM	DWAGE	DGDP	DRLP
DUNEMPL(-1)	1.83E-15	-7.04E-17	2.11E-16	-9.01E-15	-3.24E-13
	(2.9E-16)	(2.5E-17)	(3.9E-16)	(1.8E-14)	(9.9E-14)
	[6.21234]	[-2.84637]	[0.53742]	[-0.50423]	[-3.27393]
DUNEMPL(-2)	-1.58E-16	-6.93E-17	-6.53E-16	-5.07E-14	-1.62E-13
	(2.4E-16)	(2.0E-17)	(3.2E-16)	(1.5E-14)	(8.2E-14)
	[-0.65202]	[-3.39821]	[-2.01650]	[-3.43991]	[-1.98535]
DEMM(-1)	-3.26E-16	4.08E-17	-1.63E-16	8.35E-14	-8.35E-14
	(7.6E-16)	(6.4E-17)	(1.0E-15)	(4.6E-14)	(2.6E-13)
	[-0.42871]	[0.63838]	[-0.16071]	[1.80941]	[-0.32635]
DEMM(-2)	-4.12E-16	1.03E-16	9.88E-16	-1.69E-13	-8.43E-14
	(7.7E-16)	(6.4E-17)	(1.0E-15)	(4.6E-14)	(2.6E-13)
	[-0.53719]	[1.59984]	[0.96661]	[-3.62763]	[-0.32714]
DWAGE(-1)	-1.75E-16	5.24E-17	1.33E-15	-5.78E-14	2.32E-13
	(2.4E-16)	(2.0E-17)	(3.1E-16)	(1.4E-14)	(7.9E-14)
	[-0.73956]	[2.64303]	[4.21402]	[-4.03828]	[2.92745]
DWAGE(-2)	3.80E-17	9.14E-17	-1.52E-16	9.72E-15	-1.94E-14
	(2.5E-16)	(2.1E-17)	(3.3E-16)	(1.5E-14)	(8.3E-14)
	[0.15421]	[4.42028]	[-0.46246]	[0.65084]	[-0.23477]
DGDP(-1)	-7.65E-19	-2.09E-19	1.15E-17	-2.94E-16	-3.92E-16
	(1.2E-18)	(1.0E-19)	(1.6E-18)	(7.2E-17)	(4.0E-16)
	[-0.64199]	[-2.09120]	[7.21987]	[-4.06437]	[-0.97740]
DGDP(-2)	3.51E-18	-6.79E-19	3.40E-18	1.30E-16	1.91E-15
	(1.2E-18)	(1.0E-19)	(1.6E-18)	(7.2E-17)	(4.0E-16)
	[2.93949]	[-6.77755]	[2.13277]	[1.80094]	[4.76398]
DRLP(-1)	1.61E-18	-3.31E-19	-7.31E-18	3.75E-16	-5.76E-16
	(7.5E-19)	(6.3E-20)	(1.0E-18)	(4.5E-17)	(2.5E-16)
	[2.14430]	[-5.26854]	[-7.31492]	[8.25838]	[-2.28523]
DRLP(-2)	0.000000	5.38E-19	2.39E-18	1.45E-16	1.04E-16
	(7.7E-19)	(6.4E-20)	(1.0E-18)	(4.7E-17)	(2.6E-16)
	[0.00000]	[8.35564]	[2.34162]	[3.12793]	[0.40297]
C	2.21E-16	1.38E-17	1.10E-16	-1.70E-13	8.48E-13
	(5.6E-16)	(4.7E-17)	(7.5E-16)	(3.4E-14)	(1.9E-13)
	[0.39520]	[0.29425]	[0.14815]	[-5.00400]	[4.51260]
DUNEMPL	1.000000	4.61E-17	5.57E-16	-3.14E-14	1.63E-13
	(2.9E-16)	(2.5E-17)	(3.9E-16)	(1.8E-14)	(9.9E-14)
	[3.4e+15]	[1.90451]	[1.42357]	[-1.57936]	[1.65186]
DEMM	9.27E-16	1.000000	-3.50E-16	-5.04E-14	2.47E-13

	DUNEMPL	DEMM	DWAGE	DGDP	DRLP
	(7.9E-16)	(6.6E-17)	(1.0E-15)	(1.8E-14)	(2.6E-13)
	[1.17833]	[1.5e+16]	[-0.33355]	[-3.05620]	[0.93131]
DWAGE	1.20E-16	4.47E-17	1.000000	-4.38E-14	7.01E-13
	(2.3E-16)	(1.9E-17)	(3.1E-16)	(1.4E-14)	(7.8E-14)
	[0.51781]	[2.27092]	[3.2e+15]	[-3.11382]	[8.98571]
DGDP	-7.21E-18	-6.37E-19	4.42E-18	1.000000	6.93E-16
	(1.1E-18)	(2.2E-20)	(1.5E-18)	(6.6E-17)	(3.7E-16)
	[-6.59313]	[- 2.48882]	[2.66188]	[1.5e+16]	[2.00495]
DRLP	-8.09E-19	-6.18E-20	7.13E-18	6.25E-13	1.000000
	(2.4E-19)	(3.2E-20)	(9.8E-19)	(1.5E-17)	(2.5E-16)
	[-3.69212]	[-2.51531]	[7.26472]	[2.00352]	[4.0e+15]
R-squared	1.000000	1.000000	1.000000	1.000000	1.000000
Adj. R-squared	1.000000	1.000000	1.000000	1.000000	1.000000
Sum sq. resids	2.31E-27	1.62E-29	4.10E-27	8.48E-24	2.61E-22
S.E. equation	3.93E-15	3.30E-16	5.25E-15	2.39E-13	1.32E-12
F-statistic	2.61E+30	2.95E+31	2.40E+30	4.13E+31	2.96E+30
Log likelihood					4287.254
Akaike AIC					-51.77278
Schwarz SC					-51.47159
Mean dependent	-0.404848	0.061388	0.929127	315.1515	550.3858
S.D. dependent	1.920391	0.441434	1.879051	463.8921	688.1184
Determinant resid covariance (dof adj.)		1.3E-138			
Determinant resid covariance		7.5E-139			
Log likelihood		25067.66			
Akaike information criterion		-302.8807			
Schwarz criterion		-301.3748			

Source: Authors' calculations.

Paradoxically, unemployment does not accelerate the leakage of labor out of studied countries, rather it slows it down. Another paradoxical aspect is that salary is positively correlated with emigration, i.e. wage growth does not decelerate labor emigration from Eastern European countries as a whole. However, this does not apply to Bulgaria, where other interdependencies are valid. The probable cause is the macroeconomic model. Bulgaria is the only country in the EU with a currency board. This macroeconomic mechanism prevents counter-cyclical regulation aimed at maintaining full employment. In other Eastern European countries, fiscal and monetary policies can be used to curb unemployment in times of recession, and therefore emigration is not affected to such an extent by cyclical and price factors, but depends on long-term structural trends, i.e. the division of labor between East and West of Europe.

At the same time, the growth of GDP has a steady negative impact on emigration, i.e. economic growth helps create new jobs that are an alternative to emigration. The labor productivity and technological progress respectively, are also slowing down the drain of the workforce from Eastern Europe. For its part, the labor force emigration impacts negatively the dynamics of GDP. Thus, the main interrelations between emigration and

macroeconomic indicators in Eastern Europe are the economic growth and the technological development. The influence of wages on economic growth is negative, which partly explains why wage growth accelerates the leakage of the workforce.

The macroeconomic interdependencies related to labor immigration to Eastern Europe are no less interesting. The links, however, are significantly different from those, related to emigration (Table 3). Unemployment, economic growth, wages and labor productivity have an impact on the dynamics of immigration. Unemployment constrains the flow of immigrants, which is natural, unlike in the case of emigration. A rise in labor productivity affects workforce inflow negatively, which is also within the ranges of what should be expected. Wages and gross domestic product have a positive influence on the immigration flow, i.e. high pay and economic development are the main factors that attract workforce. For its part, immigration also has its feedback effect. Firstly, it helps to lower wages. Secondly, it has a positive impact on labor productivity. The bottom line is that both influences affect positively the economic growth.

Table 3

Results from VAR model for Panel data. The observed process is immigration

	DUNEMPL	DIMM	DWAGE	DGDP	DRLP
DUNEMPL(-1)	1.76E-15	-5.50E-17	3.52E-16	-1.08E-13	-3.60E-13
	(2.7E-16)	(1.1E-17)	(3.9E-16)	(2.3E-14)	(1.0E-13)
	[6.60734]	[-4.92746]	[0.89509]	[-4.68001]	[-3.47998]
DUNEMPL(-2)	-3.17E-16	-9.90E-18	-3.76E-16	2.53E-14	-2.84E-13
	(2.2E-16)	(9.2E-18)	(3.3E-16)	(1.9E-14)	(8.6E-14)
	[-1.43469]	[-1.06992]	[-1.15398]	[1.32317]	[-3.30587]
DIMM(-1)	-2.78E-16	6.53E-17	-3.66E-15	2.01E-13	2.01E-12
	(1.2E-15)	(5.1E-17)	(1.8E-15)	(1.1E-13)	(4.8E-13)
	[-0.22618]	[1.27004]	[-2.01868]	[1.88478]	[4.20449]
DIMM(-2)	-1.11E-15	-3.31E-18	1.58E-15	6.78E-14	-1.36E-13
	(9.1E-16)	(3.8E-17)	(1.3E-15)	(7.9E-14)	(3.5E-13)
	[-1.22487]	[-0.08700]	[1.17535]	[0.86070]	[-0.38400]
DWAGE(-1)	-3.50E-17	1.31E-17	9.10E-16	-4.48E-15	1.97E-13
	(2.2E-16)	(9.3E-18)	(3.3E-16)	(1.9E-14)	(8.6E-14)
	[-0.15799]	[1.41384]	[2.78230]	[-0.23313]	[2.28826]
DWAGE(-2)	-6.59E-17	3.65E-17	-1.88E-16	4.82E-14	1.35E-13
	(2.3E-16)	(9.5E-18)	(3.3E-16)	(2.0E-14)	(8.8E-14)
	[-0.29062]	[3.83919]	[-0.56242]	[2.45053]	[1.53063]
DGDP(-1)	0.000000	5.34E-19	1.32E-17	-2.98E-16	-9.94E-16
	(1.2E-18)	(4.9E-20)	(1.7E-18)	(1.0E-16)	(4.6E-16)
	[0.00000]	[10.7955]	[7.57672]	[-2.91289]	[-2.16598]
DGDP(-2)	3.54E-18	-3.05E-20	-2.66E-18	-5.47E-17	-2.69E-15
	(1.2E-18)	(4.9E-20)	(1.7E-18)	(1.0E-16)	(4.5E-16)
	[3.04372]	[-0.62617]	[-1.54623]	[-0.54207]	[-5.94244]
DRLP(-1)	8.05E-19	-9.55E-20	6.60E-18	1.21E-16	-6.18E-17
	(6.9E-19)	(2.9E-20)	(1.0E-18)	(6.0E-17)	(2.7E-16)
	[1.16055]	[-3.28884]	[6.44591]	[2.01224]	[-0.22922]
DRLP(-2)	-4.05E-20	-6.08E-20	2.92E-18	-6.35E-17	-2.07E-16

	DUNEMPL	DIMM	DWAGE	DGDP	DRLP
	(7.1E-19)	(3.0E-20)	(1.0E-18)	(6.2E-17)	(2.8E-16)
	[-0.05711]	[-2.04446]	[2.78536]	[-1.03242]	[-0.75202]
C	4.37E-16	-7.82E-17	-3.55E-16	-5.60E-14	1.06E-12
	(5.1E-16)	(2.2E-17)	(7.6E-16)	(4.5E-14)	(2.0E-13)
	[0.85068]	[-3.62797]	[-0.46816]	[-1.25529]	[5.32047]
DUNEMPL	1.000000	8.25E-19	6.08E-16	-1.35E-13	5.41E-14
	(2.7E-16)	(1.1E-17)	(4.0E-16)	(1.4E-14)	(1.1E-13)
	[3.7e+15]	[0.07250]	[1.51457]	[-1.73840]	[0.51204]
DIMM	-2.24E-16	1.000000	-4.18E-15	-1.78E-14	2.85E-13
	(1.2E-15)	(4.9E-17)	(1.7E-15)	(1.0E-13)	(4.6E-13)
	[-0.19021]	[2.0e+16]	[-2.40689]	[-0.17479]	[0.62384]
DWAGE	4.93E-17	4.61E-17	1.000000	5.70E-15	7.29E-13
	(2.2E-16)	(9.3E-18)	(3.3E-16)	(1.9E-14)	(8.6E-14)
	[0.22220]	[4.95132]	[3.1e+15]	[2.29592]	[8.44954]
DGDP	-7.55E-18	4.88E-20	3.97E-18	1.000000	-1.16E-15
	(1.0E-18)	(2.3E-20)	(1.5E-18)	(8.8E-17)	(3.9E-16)
	[-7.44193]	[2.67704]	[2.64953]	[1.1e+16]	[-2.93511]
DRLP	0.000000	4.75E-20	8.11E-18	2.59E-16	1.000000
	(6.8E-19)	(2.8E-20)	(1.0E-18)	(5.9E-17)	(2.6E-16)
	[0.00000]	[2.66832]	[8.08145]	[4.40149]	[3.8e+15]
R-squared	1.000000	1.000000	1.000000	1.000000	1.000000
Adj. R-squared	1.000000	1.000000	1.000000	1.000000	1.000000
Sum sq. resids	1.98E-27	3.47E-30	4.31E-27	1.49E-23	2.99E-22
S.E. equation	3.64E-15	1.53E-16	5.38E-15	3.16E-13	1.42E-12
F-statistic	3.04E+30	3.53E+31	2.34E+30	2.36E+31	2.58E+30
Log likelihood					4276.013
Akaike AIC					-51.63653
Schwarz SC					-51.33534
Mean dependent	-0.404848	0.038109	0.929127	315.1515	550.3858
S.D. dependent	1.920391	0.274115	1.879051	463.8921	688.1184
Determinant resid covariance (dof adj.)		6.6E-139			
Determinant resid covariance		4.0E-139			
Log likelihood		25120.86			
Akaike information criterion		-303.5255			
Schwarz criterion		-302.0196			

Source: Authors' calculations.

- **Econometric study of the macroeconomic dependencies related to the international migration of labor force in Bulgaria**

The econometric study related to the emigration and immigration of the labor force in Bulgaria is set out in details in Graph 1 and Graph 2. The following variables are influenced by emigration from Bulgaria: foreign direct investment, GDP, labor productivity, wages and unemployment. The results from the applied VAR model are presented in Table 4. The strongest negative, i.e. inversely proportionate, effect of

emigration is on wages. Unlike in the panel survey, which reflects the situation in Eastern European countries as a whole, wages, measured as a proportion of the EU average, correlate negatively with emigration, i.e. the increase in relative wages limits the outflow of labor. If in the case of the other East European countries we can talk about serious long-term linking with the productive structures of the developed West European economies and about the existence of interdependence and interchangeability of the labor force, in Bulgaria the main motivation is the compensation, and respectively the effect of the law of the one price – under the conditions of competition and free movement of production factors, there is a trend towards equalization of product and factor prices. In this situation, the emigration-wage relationship is a two-way one, with emigration contributing to wage increase. We observe a pattern that we can call a paradox of wage dependent economy. The paradox is that the feedback effect of emigration on wages is about 4 times stronger than the impact of wages on emigration. In other words, if we slow down the wage growth, we will accelerate emigration, but the shortage of labor supply caused by the additional emigration will accelerate wage growth stronger, then growth, necessary to avoid the additional emigration.

In addition, the study shows that other factors that limit emigration are as follows: GDP, foreign direct investment and labor productivity, with foreign direct investment being the variable with the strongest restrictive effect on emigration. Another emigration limiting correlation that we discover from the regression equation is the impact of GDP dynamics - that is, economic growth slows the leakage of the labor force. The connection between labor productivity and emigration is inversely proportional.

Unlike the other East European countries, we find that high unemployment causes an acceleration of the labor force outflow. Emigration is something like an "option" to deal with high levels of unemployment. Through this mechanism equilibrium on the labor market is achieved as an excessive supply of labor is reduced. This means that the low levels of unemployment that we have observed in Bulgaria in recent years are related not so much to the creation of new jobs in the country, but to the depletion of the labor force. We emphasize that this is not typical for the other East European countries.

Table 4

Results from VAR model for Bulgaria. The observed process is emigration

	D(REMM)	D(RFDI)	D(RGDP)	D(RRLP)	D(RU)	D(RW)
D(REMM(-1))	-0.168882	97.07714	1642.317	-1668.083	-9.180758	3.109383
	(0.18585)	(106.912)	(2362.63)	(1479.59)	(22.0481)	(0.60106)
	[-0.90868]	[0.90801]	[0.69512]	[-1.12740]	[-0.41640]	[5.17317]
D(REMM(-2))	-0.258959	-2.471558	-117.1498	-209.9151	0.357934	0.974717
	(0.07791)	(44.8194)	(990.459)	(620.272)	(9.24298)	(0.25198)
	[-3.32368]	[-0.05514]	[-0.11828]	[-0.33842]	[0.03872]	[3.86830]
D(RFDI(-1))	-0.014073	1.942013	25.84948	-18.94395	-0.435515	-0.099306
	(0.00319)	(1.83277)	(40.5021)	(25.3643)	(0.37797)	(0.01030)
	[-4.41715]	[1.05961]	[0.63823]	[-0.74687]	[-1.15226]	[-9.63775]
D(RFDI(-2))	-0.014405	-4.818623	-33.44744	79.82070	0.500335	0.241025
	(0.00574)	(3.30432)	(73.0218)	(45.7296)	(0.68144)	(0.01858)
	[-2.50773]	[-1.45828]	[-0.45805]	[1.74549]	[0.73423]	[12.9744]

D(RGDP(-1))	-0.000215	0.074449	0.096030	-1.232047	-0.009246	0.000495
	(8.4E-05)	(0.04811)	(1.06314)	(0.66579)	(0.00992)	(0.00027)
	[-2.56847]	[1.54753]	[0.09033]	[-1.85051]	[-0.93194]	[1.83076]
D(RGDP(-2))	0.000566	0.242178	1.318514	-3.483431	-0.034288	0.011692
	(0.00032)	(0.18161)	(4.01346)	(2.51342)	(0.03745)	(0.00102)
	[1.79198]	[1.33348]	[0.32852]	[-1.38593]	[-0.91547]	[11.4515]
D(RRLP(-1))	-0.001457	0.215280	1.181767	-3.989989	-0.037211	0.012241
	(0.00033)	(0.18697)	(4.13184)	(2.58755)	(0.03856)	(0.00105)
	[-4.48410]	[1.15141]	[0.28601]	[-1.54199]	[-0.96504]	[11.6450]
D(RRLP(-2))	-0.000525	0.035361	-0.556305	-0.623609	-0.013406	0.002645
	(8.6E-05)	(0.04954)	(1.09483)	(0.68563)	(0.01022)	(0.00028)
	[-6.09895]	[0.71376]	[-0.50812]	[-0.90954]	[-1.31215]	[9.49486]
D(RU(-1))	0.028972	6.484699	36.59364	-71.09238	-1.204425	0.345768
	(0.00925)	(5.32268)	(117.625)	(73.6624)	(1.09768)	(0.02992)
	[3.13111]	[1.21832]	[0.31110]	[-0.96511]	[-1.09725]	[11.5548]
D(RU(-2))	0.035429	-5.902705	-40.43273	95.61910	0.922683	0.286907
	(0.00882)	(5.07588)	(112.171)	(70.2469)	(1.04678)	(0.02854)
	[4.01512]	[-1.16289]	[-0.36046]	[1.36119]	[0.88145]	[10.0540]
D(RW(-1))	-0.146157	-41.92806	-147.1848	710.5544	7.806427	1.852254
	(0.05394)	(31.0280)	(685.685)	(429.408)	(6.39882)	(0.17444)
	[-2.70970]	[-1.35130]	[-0.21465]	[1.65473]	[1.21998]	[10.6183]
D(RW(-2))	-0.247221	-43.42816	-189.0590	776.9314	7.542183	3.010684
	(0.06200)	(35.6678)	(788.218)	(493.619)	(7.35566)	(0.20052)
	[-3.98716]	[-1.21757]	[-0.23986]	[1.57395]	[1.02536]	[15.0140]
C	0.025152	-3.952107	-16.28962	98.82584	0.817323	0.222456
	(0.00766)	(4.40856)	(97.4243)	(61.0116)	(0.90916)	(0.02478)
	[3.28196]	[-0.89646]	[-0.16720]	[1.61979]	[0.89898]	[8.97542]
R-squared	0.997422	0.854902	0.876147	0.942169	0.896344	0.999597
Adj. R-squared	0.966486	-0.886273	-0.610083	0.248197	-0.347533	0.994764
Sum sq. resids	0.000252	83.50987	40782.87	15994.43	3.551637	0.002639
S.E. equation	0.015886	9.138374	201.9477	126.4691	1.884579	0.051376
F-statistic	32.24183	0.490991	0.589510	1.357646	0.720605	206.8057
Log likelihood	56.60072	-32.36649	-75.70386	-69.15171	-10.26360	40.16843
Akaike AIC	-6.228675	6.480927	12.67198	11.73596	3.323371	-3.881205
Schwarz SC	-5.635264	7.074338	13.26539	12.32937	3.916782	-3.287794
Mean dependent	0.002221	-0.330722	7.142857	34.22857	0.221429	0.034595
S.D. dependent	0.086777	6.653752	159.1530	145.8587	1.623471	0.709983

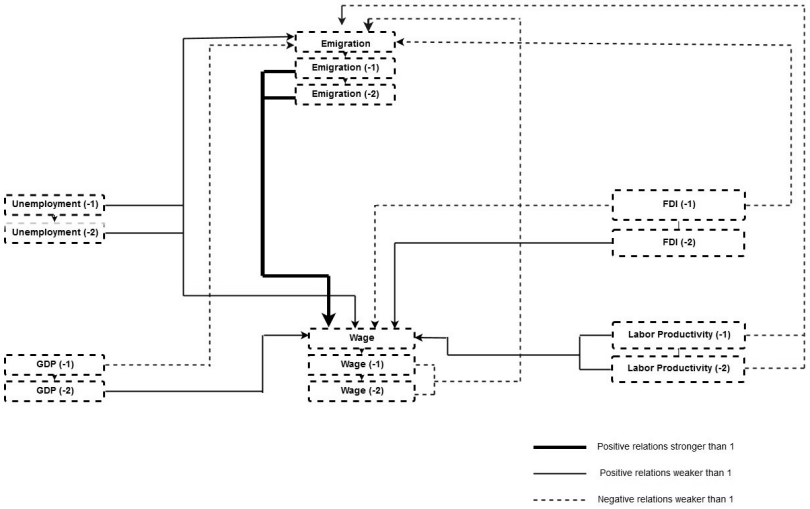
Source: Authors' calculations.

Since wages are the main factor that influences emigration, the disclosure of the variables that determine the salary itself is particularly important. Factors that have a statistically significant impact on wages are: foreign direct investment, GDP, labor productivity, emigration and unemployment. The variables that contribute to wage growth are foreign direct investment, GDP, unemployment, and labor productivity. The link between foreign direct investment and productivity is obvious – both factors reflect technological progress. The GDP-productivity-wage relation is within the so-called Verdoom's law (Verdoom, see

in more detail Castiglione, 2011), which postulates that economic growth is accompanied by productivity growth, proportional to the square root of GDP growth. The results of the analysis of the links between the surveyed variables reveal a marked positive correlation between the unemployment dynamics and the wage levels. The interrelation is straightforward, i.e. an increase in the unemployment corresponds to a rise in salary. This is a consequence of the phenomenon typical for the period after the global financial crisis - when demand shrinks, firms tend to get rid of less productive and lower-paid workers, which leads to a rise in the proportion of high-paid workers, and respectively to an upsurge in the average wages.

Graph 1

Significant relations between emigration and the explored variables in Bulgaria



Note: The exposed results are based on the VAR model
Source: Authors' calculation.

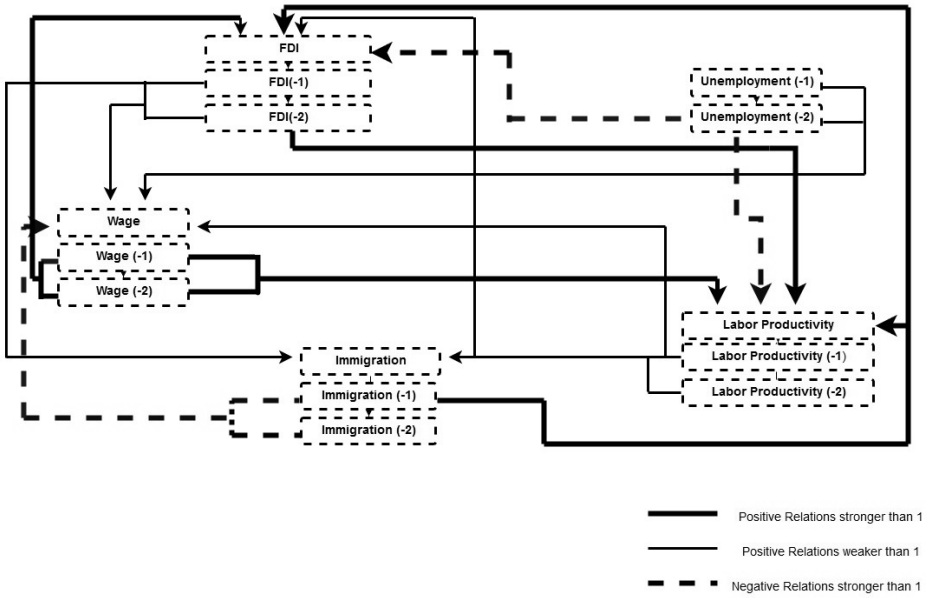
The most important relations between immigration and other explored variables are exposed at Graph 2 and Table 5. The following variables are influenced by immigration in Bulgaria: foreign direct investment and labor productivity. The impact is positive – the increased influx of investment and the rise in labor productivity increase the labor inflow to Bulgaria. This relationship is a two-way one, because the immigration affects also the abovementioned macroeconomic variables. At the same time, immigration has a negative impact on the increase in wages in Bulgaria.

We must mention that important new patterns are revealed in the case of immigration-related interdependencies. In particular, the survey shows that wages are a factor that has a positive impact on labor productivity and foreign direct investment. This effect is strong, positive and sustainable as it retains its significant pressure over all the time lags studied. The noted dependence confirms the validity of the Keynesian thesis of effective salary, i.e. that an increase in wages contributes to strengthening labor productivity.

In addition to this, a direct comparison between the weights of the coefficients, allows us to conclude that the immigration has a significantly stronger impact on labor productivity than the opposite impact. The dynamics of labor productivity and foreign direct investment also reveal a positive two-way relationship. Unemployment is a factor that has a negative impact on labor productivity and foreign direct investment. Looking at this fact, we can assess that unemployment has a sustained positive influence on wage levels. The relationship outlined above is identical to the one involved in the case of emigration analysis, i.e. whether we evaluate the emigration or immigration, the unemployment has an impact on wages.

Graph 2

Significant relations between immigration and the explored variables in Bulgaria



Note: The exposed results are based on the VAR model
Source: Authors' calculation

Table 5

Results from VAR model for Bulgaria. The observed process is immigration

	D(RIMM)	D(RU)	D(RW)	D(RGDP)	D(RRLP)	D(RFDI)
D(RIMM(-1))	-0.205320	-1.404761	-2.561944	628.0691	1432.888	92.28327
	(0.29442)	(16.3952)	(0.45652)	(1924.42)	(557.476)	(44.5402)
	[-0.69737]	[-0.08568]	[-5.61194]	[0.32637]	[2.57031]	[2.07191]
D(RIMM(-2))	-1.162441	1.717437	-1.395730	-361.1093	73.89213	-17.95790
	(0.14619)	(8.14067)	(0.22667)	(955.528)	(276.803)	(22.1155)
	[-7.95167]	[0.21097]	[-6.15744]	[-0.37792]	[0.26695]	[-0.81201]
D(RU(-1))	0.029846	-0.851841	0.290980	-13.55460	-52.89371	3.564121
	(0.01609)	(0.89607)	(0.02495)	(105.178)	(30.4685)	(2.43432)
	[1.85480]	[-0.95064]	[11.6622]	[-0.12887]	[-1.73601]	[1.28570]
D(RU(-2))	-0.026290	0.603064	0.230650	6.220911	-75.37460	-4.822409
	(0.01567)	(0.87254)	(0.02430)	(102.416)	(29.6686)	(2.37041)

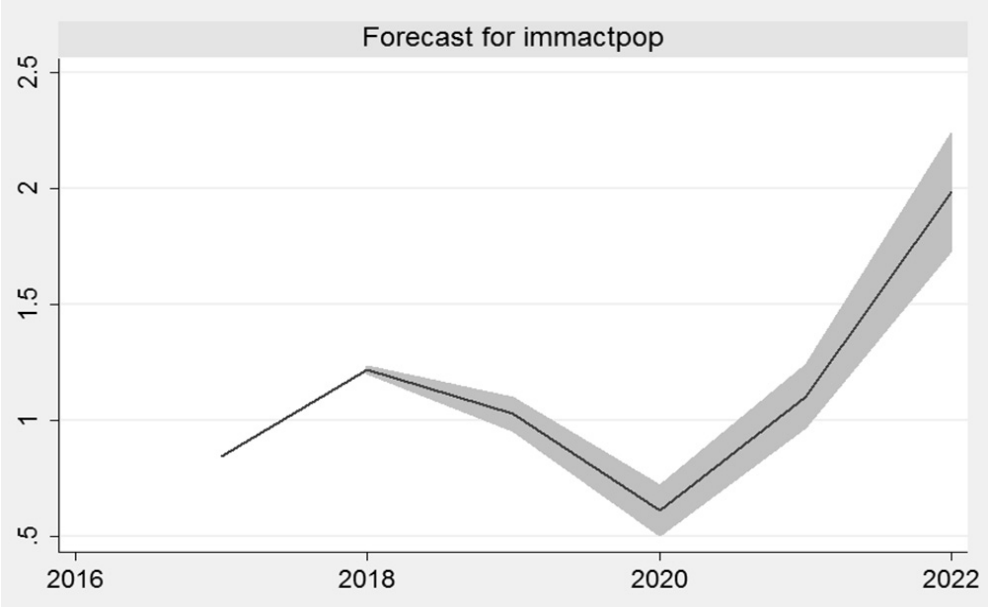
	[-1.67786]	[0.69116]	[9.49350]	[0.06074]	[-2.54055]	[-2.03442]
D(RW(-1))	-0.124032	6.193082	1.600200	81.90138	631.2035	37.86976
	(0.10792)	(6.00964)	(0.16734)	(705.394)	(204.343)	(16.3262)
	[-1.14929]	[1.03052]	[9.56279]	[0.11611]	[3.08895]	[2.31957]
D(RW(-2))	-0.213832	5.340545	2.638614	129.0157	649.9488	36.72345
	(0.11292)	(6.28797)	(0.17509)	(738.064)	(213.806)	(17.0823)
	[-1.89369]	[0.84933]	[15.0704]	[0.17480]	[3.03989]	[2.14979]
D(RGDP(-1))	-0.000377	-0.006835	0.000470	-0.170542	-0.364328	0.084347
	(0.00020)	(0.01094)	(0.00030)	(1.28354)	(0.37182)	(0.02971)
	[-1.92051]	[-0.62505]	[1.54352]	[-0.13287]	[-1.66931]	[1.83927]
D(RGDP(-2))	0.000498	-0.022834	-0.010366	-0.224548	-0.178674	0.230428
	(0.00060)	(0.03357)	(0.00093)	(3.94092)	(1.14163)	(0.09121)
	[0.82630]	[-0.68010]	[-11.0879]	[-0.05698]	[-1.78433]	[1.52630]
D(RRLP(-1))	0.001155	-0.025119	0.010049	-0.596357	-3.174838	0.171474
	(0.00056)	(0.03110)	(0.00087)	(3.64992)	(1.05733)	(0.08448)
	[2.06825]	[-0.80781]	[11.6064]	[-0.16339]	[-3.00270]	[2.02985]
D(RRLP(-2))	0.000321	-0.012772	0.002025	-0.743786	-0.272816	0.013320
	(0.00021)	(0.01159)	(0.00032)	(1.36012)	(0.39401)	(0.03148)
	[1.54263]	[-1.10224]	[6.27541]	[-0.54685]	[-0.69241]	[0.42314]
D(RFDI(-1))	0.010310	-0.318772	0.076010	8.182396	-9.022168	1.402887
	(0.00530)	(0.29522)	(0.00822)	(34.6524)	(10.0383)	(0.80202)
	[2.04472]	[-1.07977]	[9.24656]	[0.23613]	[-0.89877]	[1.74919]
D(RFDI(-2))	-0.010687	0.284813	0.214917	-4.262079	73.87758	-4.574096
	(0.01082)	(0.60265)	(0.01678)	(70.7378)	(20.4917)	(1.63721)
	[-0.98748]	[0.47260]	[12.8074]	[-0.06025]	[3.60524]	[-2.79384]
C	-0.011006	0.563382	0.154806	25.57339	64.91014	-2.029396
	(0.01318)	(0.73385)	(0.02043)	(86.1374)	(24.9528)	(1.99363)
	[-0.83515]	[0.76771]	[7.57598]	[0.29689]	[2.60132]	[-1.01794]
R-squared	0.992781	0.876094	0.999498	0.822369	0.982253	0.945560
Adj. R-squared	0.906154	-0.610773	0.993470	-1.309198	0.769283	0.292278
Sum sq. resids	0.001369	4.245450	0.003292	58491.22	4908.452	31.33259
S.E. equation	0.037001	2.060449	0.057372	241.8496	70.06035	5.597552
F-statistic	11.46036	0.589221	165.8192	0.385805	4.612169	11.447399
Log likelihood	44.76356	-11.51267	38.62296	-78.22816	-60.88274	-25.50435
Akaike AIC	-4.537652	3.501810	-3.660422	13.03259	10.55468	5.500621
Schwarz SC	-3.944242	4.095221	-3.067012	13.62600	11.14809	6.094032
Mean dependent	0.014062	0.221429	0.034595	7.142857	34.22857	-0.330722
S.D. dependent	0.120783	1.623471	0.709983	159.1530	145.8587	6.653752

Source: Authors' calculation.

Based on the results from VAR model, we construct a forecast for the dynamics of immigration and emigration in Bulgaria for the period 2017-2022 (Graph 3 and Graph 4).

Graph 3

Forecast for the immigration process in Bulgaria for 2017-2022

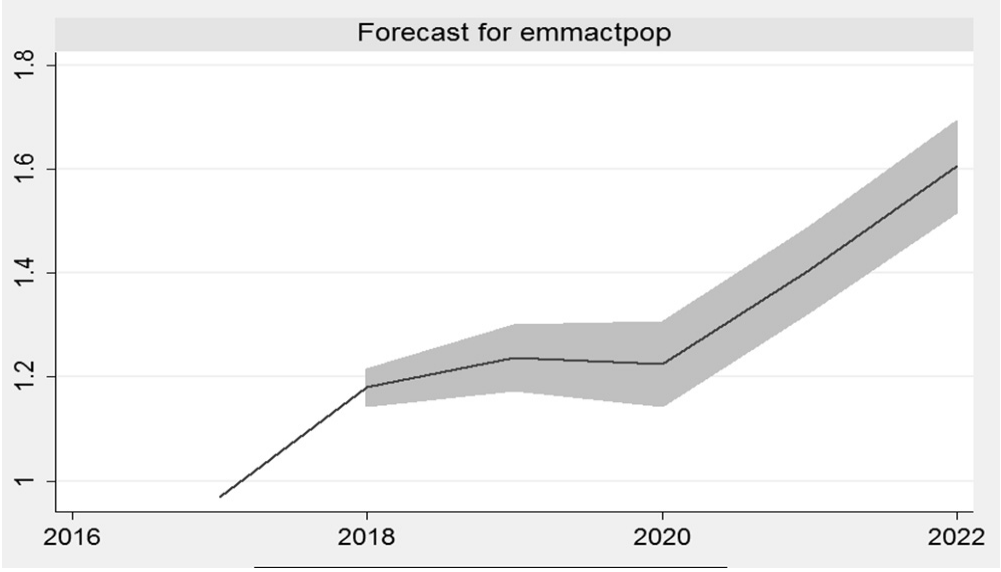


Note: The forcast is based on the results of the applied VAR model
Source: Autors' Calcualtions

On the basis of a comparison between the results of the Graph 3 and Graph 4, we may draw the following conclusions: up to the year 2020 the emigration will stay virtually constant. The immigration however is supposed to decline. Bulgarian emigrants will continue to be among the main investors in the country by transferring cash to their families in Bulgaria, thus guaranteeing an increase in the foreign currency reserves and a reduction in the current account deficit. An appropriate policy will be to keep older people on the labor market for longer periods. Increasing emigration and decreasing immigration will also contribute to low unemployment rates. After 2020, we forecast a significant increase in immigration flows. In 2022 we predict higher levels of immigration as percentage of working population, compared to those of emigration. This can be explained by the implicit virtuous circle- stronger emigration leading to higher wages, higher productivity and higher immigration.

Graph 3

Forecast for the emigration process for Bulgaria for 2017-2022



Note: The forcast is based on the results of the applied VAR model
Source: Autors' Calcualtions.

5. Conclusions on Economic Policy

As we consider the results from the current research we make the following conclusions and recommendations for Bulgarian Economic Policy:

- **Income policy**

In Bulgaria, unlike other post-communist EU Member States, wages are a major factor governing the international migration of the workforce. This is explained by three factors. First, the absence of close production links with the economies of the countries of "old" Europe and, as a consequence, insufficient synchronicity with the EU economic cycle. Second, the currency board mechanism, which prevents an active anti-cyclic policy towards maintaining full employment. Third, and perhaps most importantly, wages in Bulgaria are in the range of 17-18% of the EU average, as opposed to 35-45% for other countries, with only Romania around 20% being close to us.

Wages, measured as a proportion of the EU average, correlate negatively with emigration and positively with immigration. This means that a policy of accelerating wage growth can limit the draining of labor force and speed up the inflow of workers to the country. The growth of wages in Bulgaria in recent years ranges from 6% to 9.5% per year (IMF, 2018), without having any negative impact on the growth and financial stability of the country.

The objections to the rapid increase in wages and the minimum wage come as a rule on the part of Bulgarian business. These are related to two main theses. First, the rise in wages is limited by labor productivity, and secondly, the increase in minimum wages leads to the blurring of boundaries between high and low incomes. Our study allows a correction of these views. Firstly, with the comparatively exceptionally low remuneration in Bulgaria, the rise in wages is a stimulating factor for the rise of labor productivity in line with the concept of effective wages. Apart from this, the slowdown in wage growth has led to an acceleration in the outflow of labor, which results in an even greater shortage of labor and pressure to boost wages. The second argument does not correspond to reality either, as Bulgaria is constantly among the countries with the highest income inequality in the EU. In this situation, ***we can recommend an orientation towards sustainable growth in earnings to the extent of 8-10% annually, until the level of payment reaches for example 30% of the EU average.*** This will boost the economy and labor productivity, and it will lead to an end of the trend of population decline due to labor migration. If the current trends of a relatively rapid increase in nominal incomes continue, and if the economy is not set back due to a crisis like that of the Corporate Commercial Bank or a global financial crisis, in the next 3-4 years the number of workers entering Bulgaria will exceed the number of those who leave.

- **Taxation of income**

Income taxation also affects the real income of those who are employed and therefore on the migration. If we limit our analysis to the income tax, we need to pay attention to the following points. First, in Bulgaria is applied the so-called flat or uniform income tax, without a minimum non-taxable income. In this situation, the impact of taxation on international labor migration must be completely different for workers in the high and low-income brackets.

Let us start with low income. With the current almost full employment, Bulgarian business relies on the influx of cheap labor, mainly from the post-Soviet economic space. Unfortunately, under the Bulgarian flat tax arrangement, which does not include a tax-exempt minimum threshold, with the same nominal salary, a worker who has chosen Bulgaria as a workplace is guaranteed a smaller disposable after-tax income. This is so because all the other EU member states, including those post-communist countries that apply a flat tax, provide for a very serious non-taxable minimum threshold. For the same reason, Bulgarian workers looking for higher incomes in "old" Europe, in reality, enjoy lower taxation despite the high tax rates on higher income levels in the countries where Bulgarian emigrants are settling. Thus, ***the flat-rate tax arrangement applied in Bulgaria in practice reduces the wage competitiveness of the country at low income levels.***

It must be expected, however, that the high-income situation is different. And this is the case. The upper bracket, i.e. the maximum taxation on high income in Western European countries is far higher, often around 4-5 times higher than in Bulgaria. This is a serious advantage that could potentially help to overcome the serious situation with the shortage of highly qualified labor force in Bulgaria, not only by attracting Bulgarians working abroad but also by drawing highly qualified specialists from all over the world. In parallel with

this, low taxation of high incomes should keep highly qualified staff on the internal market. However, both trends do not in reality exist, apart from some exceptions.

The main reason is the mindset of the private and state business in Bulgaria. According to reports of the World Economic Forum, Bulgaria is practically the last in the world regarding the ability to attract and retain talented, highly-trained specialists. This is related to the specific nature of Bulgarian capitalism, which can be characterized as being based on informal connections, or crony capitalism, in which personal contacts play a decisive role, as opposed to talent and abilities, which fade into the background.

Apart from this, the generation of a real demand for highly qualified specialists implies the existence of an efficient high-tech sector. The existence of high-tech potential depends, on the other hand, on providing adequate financing (venture capital, investment banks, developed capital market, state funds, access to EU structural funds, EIB resources, EIF, the Juncker plan, etc.), state policy in the field of education, science and research, the existence of clusters that unite businesses, universities and the financial sector, the creation of free industrial zones, business incubators, the state of the justice system, the efficiency of public administration, etc. All of these are areas where our country is not just lagging behind but is often at last place in the EU.

We can conclude that ***the presence of comparative advantages in the area of taxation is not in itself significant if the overall context of the socio-economic conditions for doing business is not sufficiently stimulating***. However, a common strategy to support high-tech business could turn flat taxation into a competitive advantage in the high-tech field in the foreseeable future, although in the longer term the evolution of the tax system should rather be in the direction of moderately progressive tax rates.

- **Foreign investment**

A study shows that foreign direct investment has a strong impact on labor productivity and therefore on labor income, respectively on labor emigration and immigration. As mentioned above, our study suggests a policy of accelerated wage growth, plus the introduction of a non-taxable minimum.

Potentially, this could have a counterproductive effect on economic growth and foreign investment. However, the survey shows that, at the current level of income, the further increase in earnings has practically no impact on foreign investment. On the other hand, high incomes have an impact on labor supply, both in terms of delaying emigration and from the point of view of attracting foreign workers. Increased purchasing power and the expansion of the internal market also have a positive impact on attracting of foreign direct investment.

Raising incomes has a limited negative impact on GDP growth in the short-term, but in the perspective of the current analysis, expanding demand and increasing labor productivity have a far stronger encouraging effect. Therefore, a policy of stimulating foreign direct investment will have net positive results in terms of labor productivity, incomes, reducing emigration and motivating labor immigration.

Unfortunately, in recent years, foreign direct investment has declined. The reasons for this are mainly related to the institutional climate, inadequate funding and the unsatisfactory functioning of the judicial system. What is necessary is a comprehensive policy for attracting foreign investment, with an emphasis on specific strategic investors in the high-tech sector with a view of integrating the Bulgarian economy into the high levels of the global value chains.

- **Administrative regulation of labor migration**

Given Bulgaria's participation in the free movement of labor force in the EU, Bulgaria depends strongly on its own regulations in the area of the immigration of workers. For now the main goals are in the sphere of attracting low-paid and low-skilled workers. Taxation in Bulgaria, however, works contrary to this objective. ***With regard to highly qualified specialists, the main problem is the existence of slow and highly bureaucratic procedures.*** Bulgaria, which offers particularly favorable conditions in the area of high incomes, should ease the administrative restrictions for attracting highly qualified workers and immigrants with significant capital. This must be an element of a ***common policy of accelerated development of the high-tech sector and luring of foreign direct investment.***

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