Pudryk, Denys; Legenkyi, Mykola; Alioshkina, Liudmyla

Article

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Denys Pudryk,
Ph.D., The Customer Service in Odesa, Ukraine
email: pudrik.nusta@ukr.net
Mykola Legenkyi,
Dr.Sc., Vinnytsia State Pedagogical University, Ukraine
ORCID ID, 0000-0003-4179-1964
email: legenkyj@ukr.net
Liudmyla Alioshkina,
Ph.D., Uman National University of Horticulture, Ukraine
ORCID ID, 0000-0002-1647-0141
email: ljudmila.aleshkina@gmail.com

Correspondence author: pudrik.nusta@ukr.net

INNOVATION DEVELOPMENT AND MIGRATION: PANEL DATA APPROACH

Abstract. *The intellectual capital is a catalysator of the country's economic growth. The developed countries try to develop attractive conditions for highly qualified migrants to diffuse the knowledge and innovations. The authors provided the bibliometric analysis of the papers, which focused on the analysis of the migrant issues was done. For the bibliometric analysis, the metadata of 2 500 papers was selected from Scopus. The results showed that the numbers of Scopus documents on the allocated theme have increased for 2015 year. The most powerful investigations were provided by scientists from the USA, Canada, France, United Kingdom. The bibliometric analysis findings confirmed that the scientists allocated a vast range of the determinants that could stimulate or restrict the migrants in the country. Thus, the governance efficiency had the mediation role between the migration and innovation development of the country. In this case, the paper aims to check the hypothesis that the increasing (decreasing) level of country innovation development and government efficiency from year t − 1 to year t positively (negatively) affects net migration in year t + 1. The panel data for 2011-2018 was generated from IndexMundi, EU Data Portal, WorldBank. The object of the investigation was Bulgaria, Croatia, Lithuania, Latvia, Poland, Romania. The dependent variables – net migration rate, the independent variables – World Government Indicators: Control of Corruption, Government Effectiveness, Political Stability, Rule of Law, Regulatory Quality, Voice and Accountability (for assessment of government efficiency), Innovation Index (for assessment of country's innovation development). In the paper, to check the hypothesis, the authors used the Fully Modified Ordinary Least Square for homogeneous and heterogeneous models. The findings confirmed that innovation development and governance efficiency (Political Stability and Absence of Violence/Terrorism, Regulatory Quality, Voice and Accountability) had a statistically significant impact on the migration rate. The findings could be used to identify the strategic goals of innovation development to overcome the demographic issues and support the migration of the high qualified workforces.*

Keywords: migration, human development, innovation, policy, governance.

Introduction. Human recourses and intellectual capital are the core determinants of a country's development. One of the economic paradigms based on the concept that migrants allow accumulate and renew human recourses and intellectual capital. Note that the EU Association's fundamental principles are providing the free movement of the citizens, goods, and services between the EU members. It allows sharing the knowledge and best practices among all members. From the other point of view, it provokes a range of issues for old EU members as for the latest members.

The economic prosperities of the EU countries and political stability attract an increasing number of immigrants. However, it leads to apereas of the vast range of social inequalities in the EU countries. For the less developed countries, the first biggest issue is the brain drain from origin countries. Considering the official dataset, after 2004 (year of EU integration) in Poland (from -0,949 in 2014 to -1,137 in 2016, 2016-2020 – declining to -0.571), the net migration rate declined. It meant that the numbers of emigrants were higher than immigrants. In Germany's opposite situation, the net migration rate in 2008 was 0,106 (year of the financial crisis) and in the 2018 year was 6,569. In Italy, the lowest level was 1,687 in the 2000 year and the highest (5,462) in 2013. The findings allowed concluding that the highly qualified workers try to move from low- to high-income countries.

Moreover, the developed countries are interested in the high qualified migrants to boost innovation and technological development. In this case, the most developed countries try developing attractive conditions for high qualified migrants through updating the legislation base in migration regulation. Thus, France developed the "Talent Passport" for qualified migrants and their families. All EU countries have a scholarship program for supporting the high motivated youth with a robust scientific background. Besides, the migration process affected the range of factors such as political stability, innovation development, living conditions etc. In this case, it is necessary to identify the core determinant that influenced the country's migration process.

Literature Review. For the bibliometric analysis, the metadata of 2 500 papers was selected. The metadata was downloaded from Scopus on the subject areas: Economics, Business, Management and Social Science. The core keywords: innovation, migration. The dynamic publishing results in Scopus showed that issues on the relationships between migration and innovation development have been investigating for 2001 year. Besides, from 2015 the numbers of papers have started to increase (Figure 1).
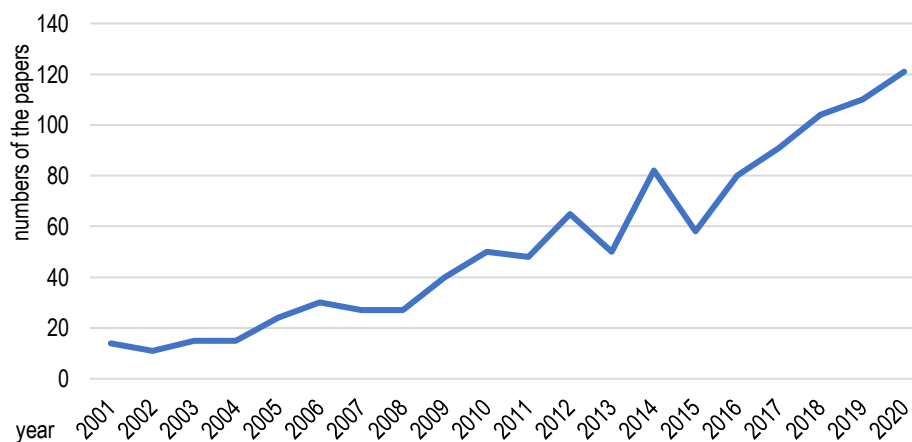
Figure 1. The dynamic of publication on migration and innovation development in the scientific journal which indexed by Scopus
Source: developed by the authors

The findings showed that the USA's scientists published the most share of the papers that focused on the investigation's issues on the linking between migration and innovation development. The top-10 countries' affiliations showed in Figure 2.
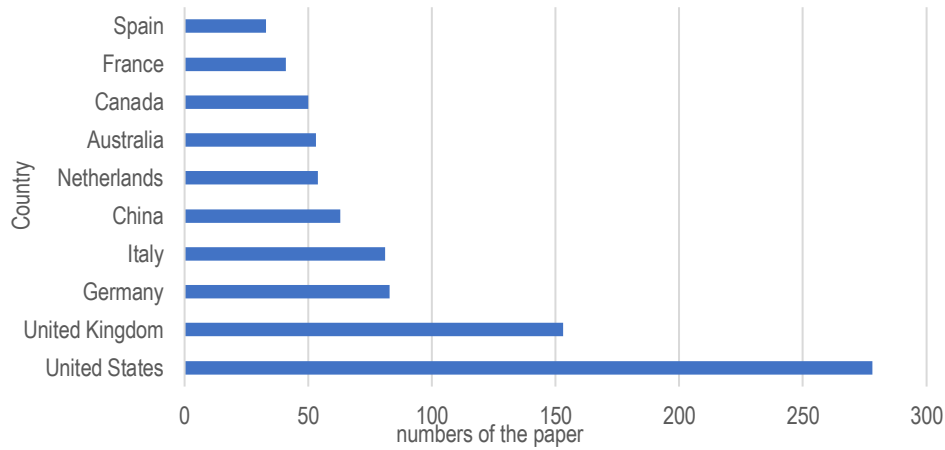
Figure 2. Top-10 countries' affiliations of the scientists which investigated migration and innovation development in the scientific journal indexed by Scopus

Source: developed by the authors

The overlay visualisation confirmed that the USA, Canada, France, and the United Kingdom started investigati**ng** migration and innovation development issues in 2013. It could be explained that those countries first met with migration issues.
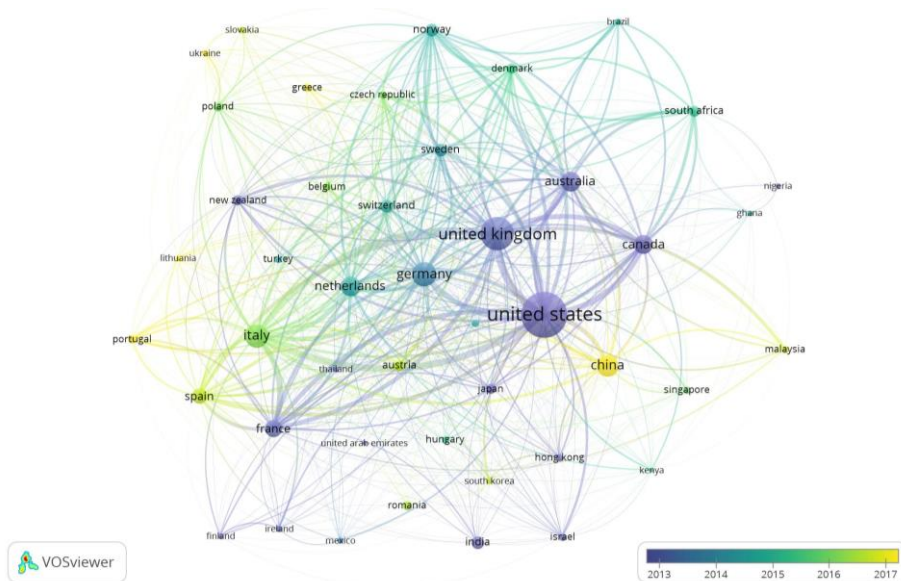
Figure 3. The overlay visualisation of the countries' affiliations of the scientists which investigated migration and innovation development

Source: developed by the authors using VOSviewer

The finding of bibliometric analysis allowed identifying the most cited paper in the analysed issues. Thus, Spohrer J. and Maglio P. (2008) highlighted that those innovations are the core driver for economic

growth, improving social development and restricting the brain drain. In the paper (Ernstson et al., 2010), the authors using the 3SLS technique confirmed that urbanisation influenced the country's innovation development and migration process. Niebuhr (2010), using the pooled OLS, proved that cultural diversity affected the diffusion of innovations among German regions. They used the patents numbers as the dependent variables of innovation development. Ferrucci, E. (2020) confirmed that migration of highly qualified workers in Europe as in the USA stimulates the countries' innovation development. In the paper (Demircioglu & Vivona, 2021), the hypothesis that public governance's efficiency in the spreading of innovations affected the migrant integrations. Blit et al. (2021) and Breschi et al. (2020) proved that improving skills among immigrants through the STEM education (Science, Technology, Engineering and Mathematics) allowed increasing the innovation development in the country. Rausser et al. (2018) and Simionescu et al. (2017) confirmed that political stability in the country had a statistically significant impact on the country's migration process and economic growth. Th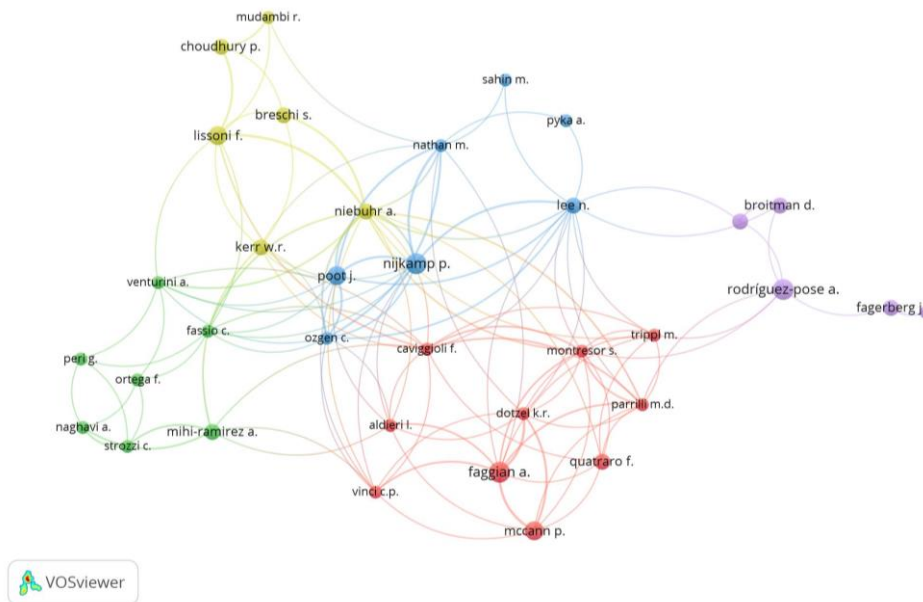e visualisation of the most potent scientific alliance in investigating relationships between innovation development and migration showed in Figure 4.

Figure 4. The visualisation of scientific alliance in the investigation issues on migration and innovation development
Source: developed by the authors using VOSviewer

The co-occurrence analysis was provided for identifying the core scientific directions in the analysis of the relationships between migration and innovation development. Thus, the findings of co-occurrence analysis allowed identifying six core clusters. The most significant cluster (red) contained 40 items and focused on analysing innovation development, digitalisation, urbanisation, cultural relations etc. Thus, the papers (Kwilinski et al., 2020; Dzwigol et al., 2020) confirmed that the economy's digitalisation influenced the workers' competencies and allowed to migrants accustom to the changes in the labour market. The scientists in the paper (Rubanov et al., 2020) confirmed that innovations and digitalisation stimulated the development of FinTech, which allowed providing a favourable business climate for entrepreneurs.

The second biggest cluster (green) contained 38 items and focused on analysing the relation between sustainable development, patent development, regional planning, social and economic effects, etc. The papers (Kharazishvili et al., 2020; Pimonenko et al., 2020) The third cluster (blue) contained 33 items and focused on analysing education issues, cultural diversity, gender aspects, etc. In the paper (Vorontsova et al. 2018), the linking among innovation, education and country growth were confirmed using the structural equitation model. The fourth cluster (yellow, 21 items) focused on the relationship between migration, brain drain, morbidity etc. The findings confirmed that migration had a mediation role between other clusters. The high score of links between clusters and the close location of the clusters confirmed that all scientific directions analyse in the relationship (Figure 5).
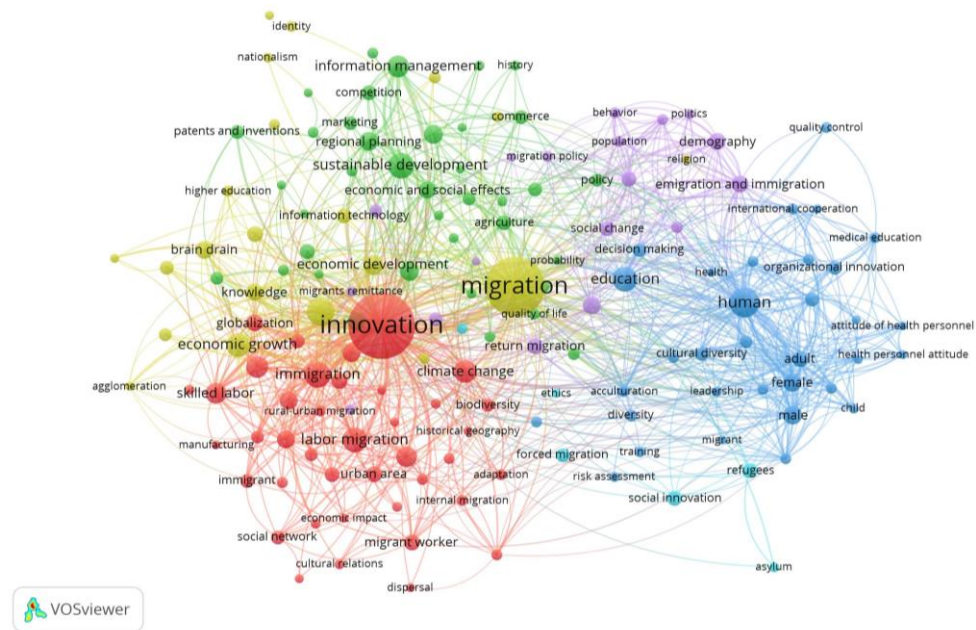
Figure 5. The visualisation of scientific clusters in the investigation issues on migration and innovation development
Source: developed by the authors using VOSviewer

The findings confirmed that the efficiency of governance affected the migration and innovation development of the country. Thus, the political stability could attract migrants or restrict their moving. The paper's findings (Dimant et al., 2013) confirmed that the level of corruption had a positive, statistically significant impact on the number of highly qualified migrants. Simultaneously, the opposite conclusion was proved by the authors in the paper (Ariu & Squicciarini, 2013). They confirmed that corruption harmed the numbers of migrants. In this case, the paper aimed to analyse governance efficiency as the mediation role between the country's migration and innovation development.

Methodology and research methods. The results of the abovementioned analysis allowed identifying two core hypotheses of the investigation:

H1: An increase (decrease) in the level of country innovation development from year t − 1 to year t positively (negatively) affects net migration in year t + 1.

H2: An increase (decrease) in government efficiency from year t – 1 to year t → increase (decrease) level of country innovation development → negatively (positively) affects net migration in year t + 1.

In the paper to check the hypothesis, the authors used the Fully Modified Ordinary Least Square for homogeneous and heterogeneous models:

$$Mig_{it} = \alpha_0 + \alpha_1 Innov_{it} + \alpha_2 WGI_{ijt} + \epsilon \qquad (1)$$

where Mig – net migration rate (the dependent variables) for country i in time t; Innov – Innovation Index (for assessment of country's innovation development); the independent variables – World Government Indicators: Control of Corruption (WGI_CC), Government Effectiveness (WGI_GE), Political Stability (WGI_PS), Rule of Law (WGI_RL), Regulatory Quality (WGI_RQ), Voice and Accountability (WGI_VA); $\alpha_0 ... \alpha_2$ – coefficients of slope parameters; ϵ – Stochastic Error term

The explanation of the model's variables and sources presented in Table 1.

Table 1. The explanation of the variables for the FMOLS model

Variable	Definition	Source
Mig	The difference between the number of persons entering and leaving a country during the year per 1,000 persons (based on midyear population)	IndexMundi
Innov	The overall performance of each country's innovation system (composite indicator)	EU Data Portal
WGI_CC	Control of Corruption – «capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests» (p. 4, Kaufmann et al., 2011)	
WGI_GE	Government Effectiveness – «capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies» (p. 4, Kaufmann et al., 2011)	
WGI_PS	Political Stability and Absence of Violence/Terrorism – «capturing perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism» (p. 4, Kaufmann et al., 2011)	WorldBank
WGI_RL	Rule of Law – «capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence» (p. 4, Kaufmann et al., 2011)	
WGI_RQ	Regulatory Quality – «capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development» (p. 4, Kaufmann et al., 2011)	
WGI_VA	Voice and Accountability – «capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media» (p. 4, Kaufmann et al., 2011)	

Sources: developed by the authors based on IndexMundi (2021), EIS (2019), WorldBank (2021)

For the analyses, the countries were chosen as follows: Bulgaria, Croatia, Lithuania, Latvia, Poland, Romania. The panel data for 2011-2018 was generated from IndexMundi, EU Data Portal, WorldBank.

The first determines the order of series integration using unit root tests (Levin et al. (LLC) (2002) and ADF Fisher Chi-square (ADF-Fisher) (ADF-Fisher) (2003)). Provided that the variables are integrated of

order one, the cointegration of the series would be further assessed by Pedroni's (2000) panel test using the model:

$$\begin{cases} y_{it} = z'_{it}\gamma_{it} + x'_{it}\beta_{it} + e_{it} \\ \quad e_{it} = r_{it} + u_{it} \\ \quad r_{it} = r_{it-1} + \varphi_i u_{it} \end{cases} \tag{2}$$

where T – the number of observations over time t = 1 ,..., T; N – the number of countries i = 1,..., N in the panel; y_{it} – white noise disturbance term; x_{it} – K-dimensional vector of regressors; z – a vector of deterministic components and M refers to the number of structural breaks.

The study used the statistical package EViews for the calculations and empirical justification of the highlighted hypothesis.

Results. At the first step, the analysis of the statistical parameters of the research samples was done. The findings of the descriptive statistics presented in Table 2.

Table 2. Descriptive statistics for the variables in the FMOLS model

Statistics	Innov	Mig	WGI_CC	WGI_GE	WGI_PS	WGI_RL	WGI_RQ	WGI_VA
Mean	0.248	-4.442	0.226	0.532	0.509	0.482	0.794	0.673
Median	0.251	-2.445	0.245	0.669	0.504	0.418	0.770	0.640
Maximum	0.391	-0.775	0.739	1.185	1.072	1.029	1.277	1.105
Minimum	0.144	-11.595	-0.267	-0.329	0.017	-0.112	0.356	0.312
Std. Dev.	0.054	3.532	0.332	0.423	0.291	0.382	0.285	0.248
Skewness	0.278	-0.725	-0.070	-0.531	-0.029	-0.124	0.052	0.127
Kurtosis	3.483	1.907	1.616	2.155	2.084	1.550	1.444	1.562
Jarque-Bera	1.086	6.594	3.871	3.687	1.686	4.330	4.863	4.262
Probability	0.581	0.037	0.144	0.158	0.430	0.115	0.088	0.119
Sum	11.922	-213.228	10.864	25.559	24.414	23.135	38.135	32.312
Sum Sq. Dev.	0.135	586.296	5.187	8.413	3.993	6.844	3.821	2.889

Sources: developed by the authors.

The Jarque-Berra statistics entails that all the variables are normally distributed (Table 2). The positive value of Skewness for indicators Innov, WGI_RQ, WGI_VA confirmed the right distribution of the variables from their mathematical expectation. However, the negative asymmetry for Mig, WGI_CC, WGI_GE, WGI_RL allowed concluding that the longest part of the distribution curve was on the left side from the mathematical expectation.

The findings showed that the average value of innovation development was 0.248. The most significant contribution was made by the rapid growth of Lithuania's innovation development index (Figure 6). Simultaneously, during the analysed period in the EU, four Nordic countries (Sweden, Finland, Denmark, and the Netherlands) were the leader on the innovation development index. Besides, the negative value of Lithuania's migration rate was the biggest among all analysed countries (Figure 6). It should be noted the negative balance (the number of emigrants was higher than immigrants) for the panel data of the countries. Such results were the consequences of the intellectual capital's free movement to the competitive, economic, and innovative developed countries. Thus, considering the data of IndexMundi (2021) in the first year of Lithuanian membership in the EU (2004 year), the numbers of emigrants increased by 1.4 times (from 22.7 to 32.5 thousand of people). Most Lithuanian emigrants moved to Great Britain (26% of all emigrants), Ireland (20%), Germany (9%), and Spain (6%). However, the people who come back to Lithuania graduated abroad, and their age was less than 35.
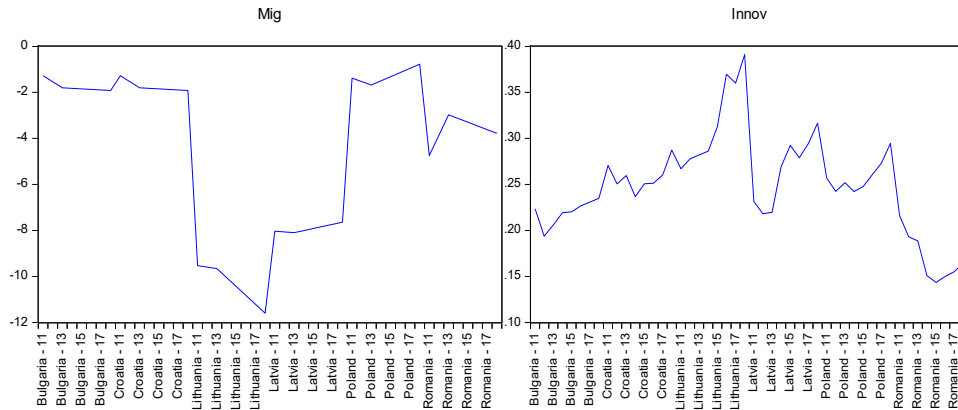
Figure 6. Countries innovative development and migration flows
Sources: developed by the author.

On average, among analysed countries, the governance efficiency was in the interval 0.226 to 0.794, the maximum 2,5 (WorldBank, 2021). Table 3 contained the correlation analysis finding between indicators WGI_CC, WGI_GE, WGI_PS, WGI_RL, WGI_RQ, WGI_VA.

Table 3. Result of correlation analysis between the Worldwide Governance Indicators

	WGI_CC	WGI_GE	WGI_PS	WGI_RL	WGI_RQ	WGI_VA
WGI_CC	1	0.815153	0.759487	0.87124	0.757307	0.923852
WGI_GE	0.815153	1	0.714471	0.813154	0.742905	0.798128
WGI_PS	0.759487	0.714471	1	0.654666	0.488126	0.762516
WGI_RL	0.87124	0.813154	0.654666	1	0.864982	0.925205
WGI_RQ	0.757307	0.742905	0.488126	0.864982	1	0.857193
WGI_VA	0.923852	0.798128	0.762516	0.925205	0.857193	1

Sources: developed by the author.

The highest statistical correlation value was between Rule of Law and Voice and Accountability (0.925205), Control of Corruption та Voice and Accountability (0.923852). In contrast, the lowest approximated correlation value exists between Political Stability (WGI_PS) and Regulatory Quality (WGI_RQ) which is 0.488126. The positive value of pairwise correlation for all independent variables confirmed that increasing one indicator provoked increasing in the other. Simultaneously, the highest values of correlation between WGI_CC, WGI_GE, WGI_PS, WGI_RL, WGI_RQ, WGI_VA justified the separate consideration governance efficiency indicators in Fully Modified Ordinary Least Square for homogeneous and heterogeneous models with the purpose to eliminate the multicollinearity.

The panel unit root test's findings allowed rejecting the hypothesis that selected variables were non-stationary (Table 4).

Table 4. Panel unit root results for the coefficients in the FMOLS model

Variables	Test statistics		Individual intercept		Variables	Individual intercept	
			Level	First difference		Level	First difference
Innov	LLC	Statistic	-0.34381	-5.57004	*Mig*	-4.57653	-2700.78
		p-value	0.3655	0.0000*		0.0000*	0.0000*
	ADF - Fisher	Statistic	4.94736	20.9328		27.0037	36.8414
		p-value	0.9597	0.0514***		0.0077*	0.0002*

Continued Table 4

WGI_CC	LLC	Statistic	2.19241	0.9858	WGI_GE	-3.68429	-4.38850
		p-value	-6.95305	0.0000*		0.0001*	0.0000*
	ADF - Fisher	Statistic	4.25735	18.6663		12.7982	-1.30519
		p-value	0.9783	0.0969***		0.3839	0.0959***
WGI_PS	LLC	Statistic	-2.85374	-26.4434	WGI_RL	-1.77914	-3.98586
		p-value	0.0022*	0.0000*		0.0376***	0.0000*
	ADF - Fisher	Statistic	22.3551	48.1398		10.0155	23.5341
		p-value	0.0337***	0.0000*		0.6146	0.0235**
WGI_RQ	LLC	Statistic	-0.25125	-0.71052	WGI_VA	-1.14972	-4.26798
		p-value	0.4008	0.0387**		0.1251	0.0000*
	ADF - Fisher	Statistic	8.11383	21.4967		10.4586	25.8398
		p-value	0.7762	0.0436**		0.5758	0.0113***

Source: Authors' calculations. *,**,*** represent significance at the 1, 5, 10% levels

Therefore, at the level variables WGI_PS and Mig. (in both tests LLC and ADF-Fisher), WGI_GE and WGI_RL (in LLC test) were stationary. However, all variables had become stationary at the first difference in all tests. The stationarity of the data allowed conducting the cointegration analysis among variables using the Pedroni panel cointegration test. The empirical results of the cointegration analysis showed in Table 5.

Table 5. The findings of the Pedroni Residual Cointegration Test

	Statistic	Prob.	Weighted Statistic	Prob.
Alternative hypothesis: common AR coefs. (within-dimension)				
Panel v-Statistic	-1.521212	0.9359	-2.385078	0.9915
Panel rho-Statistic	1.710288	0.9564	1.643076	0.9498
Panel PP-Statistic	-2.749566	0.0030	-4.686328	0.0000
Panel ADF-Statistic	-2.622655	0.0044	-4.059318	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho-Statistic	2.298091	0.9892		
Group PP-Statistic	-3.723144	0.0001		
Group ADF-Statistic	-3.656766	0.0001		

Sources: developed by the authors

Considering the findings in Table 5, 6 among 11 probabilities of the test had the statistical significance at 1% level (Panel PP-Statistic, Panel ADF-Statistic, Group PP-Statistic, Group ADF-Statistic, Panel PP-Statistic (weighted statistic), Panel ADF-Statistic (weighted statistic). It allowed rejecting the hypothesis of non-cointegration among analysed variables. Table 6 contained the findings of checking the H1.

Table 6. Fully modified ordinary least squares results (independent variable: Innov)

Model	Variable	Coefficient	Std. Error	t-Statistic	Prob.	R-squared
Homogeneous	*Innov*	-6.337975	2.814727	-2.251719	0.0307	0.991534
Heterogeneous		-5.413839	1.275386	-4.244863	0.0002	0.991495

Sources: developed by the authors

The findings in Table 6 confirmed that H1 that increasing the country innovation development from year t − 1 to year t positively affects net migration. The innovation development catalyses human capital accumulation and restricts the outflow of highly qualified workers. Thus, the results of analyses of the

panel data for selected countries, the increase of innovation development by 1% led to positive growth of Mig by 6,33% in homogeneous model and by 5,41% in heterogeneous model.

The findings of Fully Modified Ordinary Least Square for homogeneous and heterogeneous models on relationships between migration, innovation development and governance efficiency showed in Table 7.

Table 7. Fully modified ordinary least squares results (independent variables: Innov, WGI_CC, WGI_GE, WGI_PS, WGI_RL, WGI_RQ, WGI_VA)

Model	Variable	Coefficient	Std. Error	t-Statistic	Prob.	R-squared
Homogeneous	*Innov*	-5.647747	2.930338	-1.927336	0.0623***	0.991614
	WGI_CC	-0.307571	0.996040	-0.308794	0.7594	
	Innov	-6.120616	2.936660	-2.084210	0.0447**	0.991577
	WGI_GE	-0.126310	0.842236	-0.149970	0.8817	
	Innov	-7.273194	2.734575	-2.659716	0.0118**	0.991935
	WGI_PS	-1.046781	0.576308	-1.816356	0.0781***	
	Innov	-5.928026	2.529846	-2.343236	0.0251**	0.993176
	WGI_RL	-1.589560	0.688159	-2.309874	0.0271**	
	Innov	-6.042155	2.858498	-2.113751	0.0420**	0.991636
	WGI_RQ	-0.207406	1.340302	0.154746	0.8779	
	Innov	-7.844678	2.566874	-3.056121	0.0043*	0.993277
	WGI_VA	-2.419854	0.958123	-2.525618	0.0164**	
Heterogeneous	*Innov*	-5.062684	0.929330	-5.447669	0.0000*	0.991596
	WGI_CC	-0.402987	0.315885	-1.275740	0.2107	
	Innov	-5.576962	0.883886	-6.309595	0.0000*	0.991624
	WGI_GE	-0.028158	0.253499	-0.111078	0.9122	
	Innov	-6.362363	1.231637	-5.165778	0.0000*	0.992068
	WGI_PS	-0.777808	0.259566	-2.996571	0.0051*	
	Innov	-5.561534	0.980852	-5.670104	0.0000*	0.993146
	WGI_RL	-1.687768	0.266808	-6.325786	0.0000*	
	Innov	-5.720328	1.200060	-4.766702	0.0000*	0.991681
	WGI_RQ	-0.758428	0.562688	1.347866	0.1866	
	Innov	-7.410226	0.784209	-9.449296	0.0000*	0.993329
	WGI_VA	-2.227579	0.292718	-7.609993	0.0000*	

Sources: developed by the authors. *,**,*** represent significance at the 1, 5, 10% levels

The findings in Table 7 of Fully Modified Ordinary Least Square for homogeneous model confirmed the statistically significant impact at the 1, 5, 10% levels Political Stability and Absence of Violence/Terrorism (WGI_PS), Regulatory Quality (WGI_RL), Voice and Accountability WGI_VA on the net migration rate. The high-value determination coefficient (higher than 90%) proved the substantial dependence variation of the dependent variable (Mig) from the variation of the independent variables (Innov, WGI_CC, WGI_GE, WGI_PS, WGI_RL, WGI_RQ, WGI_VA) and the high accuracy of the received models. The findings of Fully Modified Ordinary Least Square for heterogeneous model allowed identifying the core determinants of increasing the indicator Mig, such as: Political Stability and Absence of Violence/Terrorism (WGI_PS), Regulatory Quality (WGI_RL), Voice and Accountability WGI_VA. The determination coefficient of developed models was higher than 90%. Increasing by 1% indicators WGI_PS, WGI_RL, WGI_VA provoked the positive growth of indicator Mig for 10,4%, 15,9% and 24,1% respectively in homogeneous model and by 7,78%, 16,8% та 22,3% in heterogeneous model.

Conclusions. The findings of Fully Modified Ordinary Least Square (for homogeneous and heterogeneous models) allowed proving the hypothesis of the investigation for EU countries (Bulgaria, Croatia, Lithuania, Latvia, Poland, Romania): an increase (decrease) in the level of country innovation

development from year t − 1 to year t positively (negatively) affects net migration in year t + 1; an increase (decrease) in government efficiency from year t – 1 to year t → increase (decrease) level of country innovation development → negatively (positively) affects net migration in year t + 1. Thus, the 1% growth of innovation development provoked the positive growth of indicator Mig by 6,33% in the homogeneous model and by 5,41% in the heterogeneous model. The core determinants of governance efficiency on improving the migration tendencies were: Political Stability and Absence of Violence/Terrorism, Regulatory Quality, Voice and Accountability. The increasing abovementioned indicators by 1% led to positive growth Mig by 10,4%, 15,9% and 24,1% respectively in homogeneous model and by 7,78%, 16,8% and 22,3% in heterogeneous model. These results are consistent with the previous findings (Jensen, 2014; Stojčić et al., 2016; Ariu et al., 2016; Lissoni, 2018; Fassio et al., 2019). Considering the findings, the core determinants for positive changes of migration among analysed countries should be increasing the level of government efficiency and innovation development due to: improving the Quality of research investigation (experience of scientists, their number, provision and partnership with other countries); increasing the financial supporting for innovation development (readiness of the government and the public sector to support research activities, and the private sector to invest in the developing and implementation of new technologies); increasing the investor interest in innovation development (creating an attractive investment climate for technology development); active implementation of innovation in small and medium-sized enterprises; increasing the interaction of companies, hubs, centres at the international and local levels.

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Денис Пудрик, Ph.D., Одеська Митниця, Україна
Микола Легенький, д.ю.н., Вінницький державний педагогічний університет, Україна
Людмила Альошкіна, к.е.н., Уманський національний університет садівництва, Україна

Інноваційний розвиток та міграційні процеси: аналіз панельних даних

Інтелектуальний капітал є каталізатором економічного зростання країни та її інноваційного розвитку. Для акумулювання інтелектуального капіталу розвинені країни формують сприятливі умови для міграції висококваліфікованих трудових ресурсів. З метою виявлення основних наукових трендів у дослідженні проблематики міжнародної міграції авторами проведено бібліометричний аналіз. Для цього згенеровано вибірку з 2 500 статей, що опубліковані у наукових журналах, які індексуються науково-метричною базою даних Scopus. Результати бібліометричного аналізу засвідчили, що кількість публікацій з досліджуваної тематики почала стрімко зростати з 2015 року. Встановлено, що вчені з США, Канади, Франції, Великобританії зробили найвагоміший внесок у дослідженні проблематики міжнародної міграції. Авторами систематизовано основні детермінанти, які стимулюють та стримують міграційні процеси в країні. Виявлено, що на міграційні процеси впливає рівень інноваційного розвитку країни та ефективність державного урядування. З огляду на це, у статті висунуто гіпотезу, що підвищення (зменшення) рівня інноваційного розвитку країни та ефективності державного урядування з t-1 до t року позитивно (негативно) впливає на індикатор чистої міграції в t+1 році. Для дослідження сформовано панельні дані за 2011-2018 роки щодо коефіцієнту чистої міграції, індексу інноваційного розвитку та ефективності державного урядування. Інформаційною базою дослідження аналітичні звіти світової агенції IndexMundi, статистичні дані Європейського статистичного офісу та світового банку. Об'єкт дослідження: Болгарія, Хорватія, Литва, Латвія, Польща, Румунія. У якості залежної змінної обрано коефіцієнт чистої міграції, а незалежних змінних – Індикатори ефективності державного урядування (контроль корупції, ефективність урядування, політична стабільність, відсутність насильства/тероризму, верховенство права, якість нормативного регулювання, врахування думки суспільства та підзвітність уряду) та індекс інноваційного розвитку. Для перевірки висунутих гіпотез застосовано техніку FMOLS (Fully Modified Ordinary Least Square) для гетерогенних та гомогенних моделей. Емпіричні розрахунки підтвердили, що інноваційний розвиток та ефективність державного урядування (політична стабільність та відсутність насильства/тероризму, якість нормативного регулювання, врахування думки суспільства та підзвітність уряду) мають статистично значимий вплив на коефіцієнт чистої міграції. Результати проведеного дослідження можуть бути корисними при формуванні стратегічних пріоритетів інноваційного розвитку країн з метою подолання викликів демографічних змін, зниження якості трудових ресурсів та посилення міграції населення.

Ключові слова: міграція, розвиток суспільства, інновації, політика, управління.