

Empirical Analysis of the Effects of International Labor Migration in EU-27 Countries

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Abstract. *This research aims to provide a critical and comparative analysis of the effects induced by international labor migration in Europe, focusing on specific features and key factors that influence and shape the migration process in the context of the COVID-19 pandemic and geopolitical uncertainty. For conducting a comprehensive study on international labor migration among the member states of the European Union (EU-27), a cross-sectional database of specific migration, labor market, and economic welfare indicators was compiled at the level of 2021. These indicators were subjected to advanced econometric modeling embedding spatial and network analyses processed with the Stata 16 package and the JASP platform to obtain robust and valid results. Main findings of this study provide valuable insights into the evolution and impact of international labor migration, particularly in Romania and the European Union at large. This study serves as a benchmark for future migration strategies by exemplifying the specific characteristics of employees and jobs that will be required in the coming years, while also focusing on identifying the key skills and requirements of both native and migrant employees. Future trends are being analyzed by identifying the characteristics of the modern employee and the professions that will dominate the labor market in the coming years. This will help policymakers appraise migrants' ability to secure employment in an ever-changing labor market.*

Keywords: international migration, labor market, skills, employment, EU-27 member states, spatial models.

Introduction

International migration has by now become a global phenomenon, where the complexity and impact generated by emigration and immigration are felt to a very large extent. International labor migration is of particular interest from the perspective of both host and destination countries, especially in the current, recent context generated by the outbreak and rapid spread of the COVID-19 pandemic and the geopolitical conflict between Russia and Ukraine.

Modern technology, and telecommunications, especially social media, play a key role in encouraging migration. Those who have already arrived in the host countries and are working there often overestimate their "successes" and material and other gains abroad when they post photos and video content on social media, leading their compatriots back home to believe that their lives will improve in a positive, favorable way if they migrate. As internet usage and consumption grow globally and the cost of data falls in most countries, migration-related messages will most likely increase, leading to increased population flows.

As Europe's economy has begun to recover and prosper again after the pandemic, it now faces a new set of challenges. Some are new or unexpected, such as the armed conflict between

Russia and Ukraine and high inflation, others are structural but no less urgent, including climate change, digitalization, and demographic aging. Each type of challenge will motivate and drive changes in EU economic policy and decision-making, favoring investment in some sectors and undermining supply chains in others. This will differentially affect labor demand across sectors and occupations, in tandem with long-term trends such as the increasing role of the services sector in aggregate output and employment and educational/occupational modernization.

In this vein, the current study aims to appraise the impact of international labor migration at the level of the European Union (EU) member states, with a keen focus on Romania. The research also explores the journey of Romanian migrants from being unemployed to becoming employees or potential employees in a highly digitalized labor market. Amidst the Covid-19 pandemic, economic crisis, and geopolitical conflicts, it assesses individuals' capacity to transition into the digital labor market. The methodological rationale relies on spatial econometric analysis based on spatial lag and spatial error models and network analysis performed through Gaussian Graphical Models (GGMs), estimated by the Bayesian method (EBICglassso) and partial correlations method (PCOR). Both advanced econometric procedures are applied to a cross-sectional sample of indicators extracted for the EU-27 member states for 2021. The study provides a detailed and concise look at the international migration process, offering insights into how migrants navigate the challenges and opportunities of the digital economy.

The remainder of the paper provides in section 2 a synopsis of the relevant scientific literature on this topical subject, as well as the migration context in Romania, followed by the description of data/ indicators and methodology in section 3, main findings, and discussion in section 4, along with conclusions, policy implications, and recommendations in section 5.

Literature review

One of the four freedoms that come with a nation's membership in the European Union is the freedom of labor movement. This freedom extends to the union's single market. While skilled and semi-skilled citizens have migrated from many economically dynamic cities and regions, authorities in other regions—particularly those in the European periphery—are dealing with the opposite issue. These migration patterns are the primary cause of many of the sociopolitical issues that Europe is currently facing and they also result in significant regional disparities (Ratha & Supriyo, 2020).

Migration of labor has emerged as a crucial tactic for preserving livelihoods in areas with few job opportunities. Although these opportunities may have advantages, they also bring with them stressors. Five general categories can be used to group the stressors that men reported experiencing: work/employer, family, environment, recruitment process, and legal matters. Most stressors are directly linked to the workplace, where immigrants may not have the authority to assert their rights and raise concerns with their employers. The culmination of these encounters can harm the well-being of migrants, and there is a need to identify ways in which international migrants have been able to adapt to the new working environment and, more importantly, to cope with stressors (Noja et al., 2018; Marcu et al., 2018; Mak et al., 2021).

Owing to the Covid-19 pandemic-related global health crisis, job insecurity is now an indisputable global reality. Because of the uncertainty surrounding COVID-19 treatments and recovery rates, as well as the positive correlation between job insecurity and contracting the virus at work, insecurity is linked to a heightened fear of the virus (Nemțeanu & Dabija, 2023). The spread of the virus has generated numerous labor market imbalances that are difficult to manage and limit, the effects of which will be seen in the long term, mostly negative but not entirely

negative overall. Migration has decreased markedly during the pandemic, as a result of restrictions imposed by the authorities and the temporary closure of borders to prevent the spread of the virus. Apart from the worldwide scope of the pandemic, a significant concern, even for developed nations, is the disparity in skills between recent graduates and the skills employers demand. Here, two things could happen: either graduates don't have certain kinds of skills, or employers don't think graduates have the necessary level of skills (Simionescu, 2022).

The pressure on Europeans to look for temporary or permanent jobs in EU nations has significantly increased during the post-pandemic recession. On the one hand, with every nation in Western Europe experiencing a recession and rising unemployment, there may be a significant decrease in international job opportunities. However, the pandemic has highlighted how Western European economies are dependent on low-cost migrant labor from Eastern EU nations. The recession may force more Romanians to seek employment in other EU nations and increase the reliance of those who stay in the nation on remittances sent home by employees who can find employment outside Romania. (Cretan & Light, 2020).

Even though Romania has become in recent years a highly attractive work destination for nationals of other countries, at least officially, the data still show a negative migration balance, which still indicates that more Romanians leave the country to find jobs elsewhere than the number of people who officially and legally arrive in Romania for the same purpose. However, the gap has been narrowing in recent years, and trends could lead to an equalization of emigrants and immigrants and even an overtaking by immigrants. However, the pandemic has also favored reverse migration, back to the countries of origin, especially of Romanian workers working abroad, due to the suspension of some economic activities or the loss of jobs in the host countries. The decision to reverse migration in the case of Romanians, but also of other populations, has also been made in the light of fears about the loss of relatives or loved ones due to the Covid-19 pandemic or other diseases or epidemics that may occur in the future, as they have concluded that interpersonal relationships take precedence over monetary and material values, with proximity to loved ones and companionship being much more important than working across borders and working abroad.

Equally of particular importance, compared to other nations with high labor migration rates, the percentage of immigrants with medium and low skill levels is lower. In general, immigrants in Romania reside in urban areas and have greater levels of education than the average Romanian society. Additionally, they tend to be younger than the average Romanian citizen, with a higher percentage of young people among foreign nationals living in Romania than among the native population. Immigration does not necessarily solve the aging problem, it may increase the size of the population, but depending on the age of the immigrants, the age structure of the population may not change much in the current digital age.

The European Commission is constantly concerned with developing sustainable solutions to enable the EU's digital transformation, with three major objectives set for the period 2020-2025 to achieve this goal: technologies that support citizens' needs, the development of a fair and competitive economy and the development of an open, democratic and sustainable society (European Commission, 2023). These days, computers, the Internet of Things, the digital economy, and digital governance are at the center of a technological revolution that is reshaping entire societies. New technologies are changing every aspect of life, resulting in the emergence of new social structures, modes of government, and public administrations. In order to improve administrative systems' efficiency and streamline the services provided to all citizens, governments in the more developed EU member states have begun to permit the integration of new technologies.

Integrating the digital economy into administrative systems is a critical step in this technological revolution—possibly the final one (Grigorescu & Bortea, 2020). The fourth industrial revolution, which is centered on the automation of industrial processes and the use of hardware to control them, is currently affecting society. It is fueled by the extraordinary advancement of artificial intelligence. All industries must therefore adjust to survive these changes. The labor market is being significantly impacted by the economy's digitization, particularly in less developed nations. Furthermore, polarization is a consequence of the economy's digitization on the availability of jobs.

Low earners are also those who are unable to adjust quickly enough, are unable to work remotely, or lack a degree. People without a university degree, those with low incomes, those without internet access, and those who are unable to adjust and change, as well as those who are unable to work remotely, comprise the vulnerable segment of society (Trif et al., 2022). The only certain thing is that employees of tomorrow will require a combination of digital and technical skills, as well as adaptable thinking and problem-solving abilities. In a few years, robots, software, and artificial intelligence will support everyone's work, from farmers to factory workers, from shop assistants to sales managers. These findings highlight the significance of enhanced digital literacy and increased internet accessibility in maintaining a proper and well-paid job.

The ability to comprehend the meaning of knowledge, social intelligence, computational thinking, adaptive and innovative thinking, intercultural skills, and literacy are among the competencies that will be necessary for successful integration into the labor market by 2020 and beyond. The problems that population contraction imposes on a country are those of aging (especially dependency ratios) and reduced labor supply (Gordon et al., 2009).

An analysis of the employment rate in Romania in 2022, as well as the forecast for 2035, shows that it will be significantly reduced and will remain way down for people with low education, below average education, people who have not completed 12 grades or who have not attended a secondary school (Noja & Panzaru, 2021). For these people, employment opportunities will become increasingly limited and the ability to get a job without qualifications and training specific to future labor market demands will be very rare. In contrast, employment among people with a tertiary education will dominate the labor market in 2035, reaching 54%, while, as a reverse, those with secondary education will account for around 44% of the employed population. These forecasts support exactly the type of employee sought in the future, the requirement to have a degree, at least a high school diploma, to cope with and match the labor market supply.

Previous strategies to address labor shortages have mainly included encouraging more women to work, recruiting foreign labor, and increasing labor productivity. These solutions will most likely be reconsidered, rethought, and brought more and more to the forefront in terms of importance, as women's labor participation continues to be lower than that of men.

The future structure of the EU labor market and the specific demand for labor depend on a wide range of factors, including the sectors driving the economy, the relocation of operations and activities in the industrial and service sectors, the availability of relevant skills for the national workforce, advances in mechanization and digitalization of the workforce, and employment benefits, as well as healthy working conditions and foreign labor policies. In addition, the provision of high-quality skills training programs to enable workers to adapt to new economies and changing activities by promoting skills and the high accessibility of such programs to workers at home and abroad is linked to the uncertainty of the availability of the necessary skills.

If immigrants are mainly low-skilled, they will reduce average per capita income in the short term and encourage the adoption of less productive, labor-intensive technologies. On the other hand, if immigrants are mainly high-skilled, they may lead to an increase in per capita income,

also causing the economy's capital-labor ratio to rise in the long run. From a financial point of view, the main distinction between immigrants and natives lies not in the benefits they receive, but in the taxes they pay. Because they have, on average, less education, immigrants earn less money and contribute significantly less to all levels of government in terms of taxes and contributions of all kinds in the host country (Koczan et al., 2021).

Migration studies have generally moved from the 'who' and 'what' questions to the 'how' and 'why' questions in the twenty-first century, in their range of approaches and interconnected themes, compared to the beginnings in the study and research of this vast field. Research on migrants' subjective experiences, perceptions of migrant identity and belonging, and attention to the cultural (super)diversity of societies has become more prominent in academic publications, while efforts to quantify and track the geographies of migration flows and describe migrant populations in receiving countries have somewhat decreased. (Scholten et al., 2022).

Romania is currently facing a new challenge, that of mass international immigration. The country is no longer seen only as a country of emigration but has become a country capable of accepting and welcoming foreign immigrants in large numbers. In addition to the waves of migrants arriving in the country every year at an accelerated pace immediately after the outbreak of the COVID-19 pandemic, a pace also supported by the return of Romanians who left to work abroad, Romania has witnessed a new and unavoidable challenge, that of managing quickly and efficiently the transit of refugees from Ukraine and, subsequently, the process of adaptation and integration of those who have decided to stay in Romania. The refugee crisis has intensified since 2022, with the outbreak of armed conflict between Russia and Ukraine, Romania's neighboring country, from which, for fear of war and its consequences, millions of people have left, many of them transiting Romania, either to follow the natural path to other destinations or to settle here for a while. Many immigrants from Ukraine have chosen to stay in Romania on a long-term basis and to look for jobs here, their access to the labor market having been facilitated and massively supported by the Romanian authorities. On the other hand, following emigration, the countries of origin may suffer brain drain, as a result of the outflow of a high flow of highly qualified and skilled people in some fields, despite their subsequent receipt of remittances.

Data and methodology

To obtain valid and enlightening results for the current research analyzing the effects of international labor migration at the level of the EU-27 Member States, with a keen focus on Romania, a new database was compiled for 2021, comprising all EU-27 countries and a series of specific indicators presented and described below. These indicators were then subjected to empirical econometric analysis using the Stata 16 package and the JASP platform.

The following indicators were collected and used for econometric modeling:

- Gross Domestic Product per capita - GDP_C (EUR);
- Number of emigrants - EM (no.);
- Number of immigrants - IM (no.);
- Share of tertiary educated persons, age group 25-34 - TEA (%);
- Poverty risk - PR (%);
- Average monthly income - AME (USD);
- Unemployment rate of the total labor force, age group 15-74 - UR_T (%);
- Employment rate, age group 20-64 - EM_T (%);
- Number of foreign-born employees by skill level, age group 15-74 - EFB_SK_T

- (thousands);
- Number of foreign-born employees by skill level whose educational attainment has increased, age group 15-74 - EFB_SK_I (thousands);
 - Foreign-born population who managed to find a job in less than 3 months in the host country, age group 15-74 - FBP_TFJ (thousands of persons);
 - Foreign-born population by level of current skills in the main language of the host country, sex, age, country of birth and level of education, age group 15-74 - FBP_CSK (thousands of persons);
 - Foreign-born population by level of current proficiency in the main language of the host country, sex, age, country of birth, and level of education proficient - FBO_PSK (thousands of persons);
 - Number of employed migrants by job satisfaction, age group 15-74, total - ER_JS_MS (thousands of persons);
 - Number of employed migrants by job satisfaction, age group 15-74, high job satisfaction - ER_JS_MS_H (thousands of persons).

Descriptive statistics are presented in Table 1 and highlight notable differentials between the EU-27 countries in terms of economic welfare, labor market performance and international migration flows.

**Table 1. Summary statistics of the indicators used in panel analysis
(mean, standard deviation, minimum and maximum values)**

	Mean	Standard deviation	Minimum	Maximum
GDP_C	28331.48	18543.39	6950	84490
EM	91940.67	124631.6	3395	543162
IM	138676.9	192120.2	5733	874367
TEA	44.57778	9.868728	23.3	62.6
PR	20.69259	5.519053	10.8	34.5
AME	3336.147	1863.359	697.63	7860.33
UR_T	6.637037	2.894577	2.8	14.8
ER_T	74.64444	5.155754	62.6	81.7
EFB_SK_T	949.7889	1811.301	9.7	8396.1
EFB_SK_I	116.6778	172.5707	3.5	630.8
FBP_TFJ	439.25	623.289	7.5	2501.5
FBP_CSK	1622.03	3102.482	17.3	14055.4
FBO_PSK	549.2704	1059.058	3.4	3974.3
ER_JS_MS	7321.796	9888.637	268.8	41323.4
ER_JS_MS_H	3208.059	4030.191	105.7	13434.9

Source: Own data processing using the econometric package Stata 16.

The methodology used in this study relies on two types of spatial econometric models, namely spatial lag and spatial error models, as well as on network analysis performed through Gaussian Graphical Models (GGMs). Effective and simple comparative analysis and interpretation are therefore possible. The appropriate estimation, assessment, and interpretation of the properties of the objects and data gathered and modeled during this research may be aided by such a representation.

A collection of statistical techniques can be used when spatial autocorrelation arises as a result of incorrect or insufficient delineation of spatial units. Error terms contain only unmodeled interactions between regions. Analogous to regression analyses but more robust, it looks at linear causal relationships between variables while taking measurement error into account. As such, the

spatial models employed in the current study analyze spatial autocorrelation (or dependence) among data. The spatial error model (SEM) analyzes it as autocorrelation of error terms, and the spatial lag model (SLM), analyzes it as autocorrelation among observed variables. The equilibrium result arising from spatial and/or social interactions is modeled by the SLM. A distributed lag model is a time series data model used in statistics and econometrics that predicts the current values of a dependent variable based on both the current values of an explanatory variable and the lagged (previous period) values of this explanatory variable using a regression equation. The dependent variable among our neighbors affects our dependent variable in the global spatial lag model. Consequently, influences on our neighbor(s) y impact both our y and our neighbor(s) y variable, creating a feedback loop.

Network analysis was applied in this study through Gaussian Graphical Models (GGMs), estimated by the Extended Bayesian Information Criteria (EBICglassso) and partial correlations method (PCOR). GGMs allowed us to capture the interlinkages/connections between all indicators/variables employed in the empirical analysis. One benefit of GGMs is that they offer reliable intervals for anticipated states, which is helpful when estimating uncertainty. They take advantage of the independencies between variables to more compactly represent a probability distribution. Graph representation seems to be the most natural way to represent these independencies. Forecasting is made easier by graphic representation, which shows the historical trend of the data. The processing of Gaussian models also aimed at establishing the degree of interdependence between the variables, as well as identifying the main factors that influence these variables.

Results and discussion

Results of the spatial econometric analysis

In line with the leading objective of current research, namely, to provide a critical, comprehensive, and comparative analysis of international labor migration within the European Union, considering the specific features and key factors that influence and shape the migration process in the context of the Covid-19 pandemic and geopolitical uncertainty, we developed and estimated a series of spatial econometric models (spatial lag and spatial error) that are essential in capturing the amplitude of the international migration phenomenon. Main results are detailed in Tables 2-5 below.

Table 2. The impact of international labor migration on the welfare of the population in EU host countries, *Spatial Lag* and *Spatial Error* econometric methods

	(1) GDP_C <i>Spatial lag</i>	(2) GDP_C <i>Spatial Error</i>	(3) PR <i>Spatial lag</i>	(4) PR <i>Spatial error</i>	(5) AME <i>Spatial lag</i>	(6) AME <i>Spatial error</i>
EM	0.123* (0.0625)	0.176* (0.0716)	0.000173** (0.000618)	0.000171* (0.0000665)	-0.0129 (0.0183)	-0.0157 (0.0193)
IM	-0.183* (0.0829)	-0.252** (0.0893)	-0.000119 (0.000641)	-0.000117 (0.0000687)	0.0216 (0.0252)	0.0230 (0.0261)
TEA	531.7*** (140.7)	528.0** (165.5)	-0.00459 (0.115)	-0.00685 (0.127)	75.55 (42.24)	73.07 (41.72)
AME	7.456*** (1.305)	8.052*** (0.660)	-0.000694 (0.000600)	-0.000670 (0.000525)		

	(1) GDP_C <i>Spatial lag</i>	(2) GDP_C <i>Spatial Error</i>	(3) PR <i>Spatial lag</i>	(4) PR <i>Spatial error</i>	(5) AME <i>Spatial lag</i>	(6) AME <i>Spatial error</i>
EFB_SK_T	127.8*** (26.75)	141.3*** (26.86)	-0.000809 (0.0143)	-0.00228 (0.0162)	6.039 (6.277)	5.669 (6.668)
EFB_SK_I	91.60*** (27.80)	106.0*** (25.00)	-0.0321 (0.0225)	-0.0318 (0.0245)	-5.222 (7.561)	-5.206 (7.534)
FBP_TFJ	-19.39* (8.228)	-20.09* (9.061)	0.00742 (0.00491)	0.00720 (0.00541)	0.676 (1.352)	0.681 (1.369)
FBP_CSK	-84.31*** (17.32)	-92.30*** (16.88)	0.00422 (0.00851)	0.00511 (0.00952)	-3.939 (3.745)	-3.643 (4.020)
FBO_PSK	26.78** (8.727)	27.24** (9.273)	-0.00237 (0.00427)	-0.00221 (0.00471)	2.290 (1.403)	2.123 (1.441)
ER_JS_MS	0.0756 (0.796)	0.355 (0.917)	-0.000597 (0.000533)	-0.000647 (0.000551)	-0.295 (0.179)	-0.296 (0.182)
ER_JS_MS_H	4.431*** (1.104)	5.008*** (1.068)	0.000518 (0.000532)	0.000521 (0.000564)	0.0716 (0.190)	0.0538 (0.200)
_cons	-28524.4* (11202.1)	-25403.2*** (7691.2)	31.34 (18.66)	22.38*** (6.502)	-2575.9 (1887.0)	110.6 (1818.9)
rho						
_cons	0.211 (0.491)		-0.448 (0.828)		0.717** (0.261)	
sigma						
_cons	4659.3*** (599.6)	4119.2*** (551.3)	3.751*** (0.801)	3.699*** (0.741)	1157.1*** (192.7)	1206.7*** (191.8)
lambda						
_cons		-1.879* (0.852)		-0.758 (1.129)		0.637 (0.394)

Note: „Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ ”

Source: Own data processing using the econometric package Stata 16.

The results obtained support a high level of significance and validity among the variables selected for the empirical analysis in terms of the influence, with a positive movement, of the share of tertiary educated persons (TEA), the average monthly income (AME), and the number of foreign-born employees whose educational level has increased (EFB_SK_I) on the Gross Domestic Product per capita (GDP_C), which will record major increases in this case. On the other hand, the evolution of the indicators of the foreign-born population according to their current level of proficiency in the main language of the host country (FBP_CSK) will lead to a decrease in GDP per capita.

Table 3. *Spatial lag* model results of the effects of international migration on migrants' labor market outcomes

	(1) EFB_ SK_T	(2) EFB_ SK_I	(3) FBP_ TFJ	(4) FBP_ CSK	(5) FBO_ PSK	(6) ER_ JS_MS	(7) ER_JS_ MS_H
IM	0.0103*** (0.00468)	0.00815*** (0.000126)	0.00172* (0.00782)	0.0171*** (0.000781)	0.00478*** (0.00460)	0.0454*** (0.00276)	0.0150*** (0.00259)
_cons	239.9 (216.9)	4.428 (28.26)	-75.82 (113.7)	189.4 (391.9)	-104.8 (141.2)	-1033.7 (1732.2)	-1103.1* (446.6)
rho							
_cons	-0.867* (0.400)	-0.00780 (0.401)	0.630* (0.315)	-0.666 (0.428)	-0.0189 (0.441)	0.311 (0.350)	0.750*** (0.222)
sigma							
_cons	499.3*** (104.0)	71.62*** (11.70)	423.8*** (112.1)	907.7*** (195.8)	522.7** (171.8)	3047.2*** (669.5)	1574.9*** (451.1)
	(1) EFB_ SK_T	(2) EFB_ SK_I	(3) FBP_ TFJ	(4) FBP_ CSK	(5) FBO_ PSK	(6) ER_JS_MS	(7) ER_JS_ MS_H
EM	0.0135*** (0.00307)	0.00111*** (0.000166)	0.00210* (0.000841)	0.0224*** (0.00500)	0.00613*** (0.00130)	0.0650*** (0.00995)	0.0211*** (0.00245)
_cons	-10.38 (344.3)	-11.36 (29.64)	-57.12 (111.2)	-188.1 (561.5)	-151.8 (154.0)	-938.5 (2311.3)	-955.5 (506.3)
rho							
_cons	-0.340 (0.690)	0.251 (0.371)	0.694* (0.278)	-0.177 (0.667)	0.279 (0.489)	0.346 (0.506)	0.748** (0.237)
sigma							
_cons	861.1*** (177.4)	88.96*** (16.56)	460.6*** (122.2)	1496.2*** (309.9)	655.9*** (184.3)	4272.1*** (880.4)	1959.0*** (547.4)

Note: „Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ ”

Source: Own data processing using the econometric package Stata 16.

According to the results, both the increase in the number of emigrants and the increase in the number of immigrants in host countries led to a positive development of the migrant-specific and labor migration indicators selected for analysis, but not in a significant way, and mostly quite small.

Table 4. *The spatial error* model results in the effects of international migration on migrants' labor market outcomes

	(1) EFB_ SK_T	(2) EFB_ SK_I	(3) FBP_ TFJ	(4) FBP_ CSK	(5) FBO_ PSK	(6) ER_ JS_MS	(7) ER_ JS_MS_H
IM	0.00930*** (0.000991)	0.000817*** (0.000101)	0.00192* (0.00957)	0.0158*** (0.00141)	0.00476*** (0.00567)	0.0484*** (0.00411)	0.0172*** (0.00361)
_cons	-371.3 (266.9)	3.437 (9.744)	136.5 (130.2)	-608.2 (405.1)	-111.8* (53.15)	590.8 (510.6)	734.2 (721.4)
lambda							
_cons	0.578 (0.495)	-0.299 (0.850)	0.512 (0.499)	0.533 (0.512)	0.0213 (0.795)	0.217 (0.657)	0.654 (0.389)
sigma							

	(1) EFB _{SK_T}	(2) EFB _{SK_I}	(3) FBP _{TFJ}	(4) FBP _{CSK}	(5) FBO _{PSK}	(6) ER _{JS_MS}	(7) ER _{JS_MS_H}
_cons	539.2*** (113.2)	71.22*** (11.55)	438.2*** (119.3)	942.5*** (197.5)	522.7** (171.8)	3106.5*** (729.2)	1722.7** (523.6)
	(1) EFB _{SK_T}	(2) EFB _{SK_I}	(3) FBP _{TFJ}	(4) FBP _{CSK}	(5) FBO _{PSK}	(6) ER _{JS_MS}	(7) ER _{JS_MS_H}
EM	0.0131*** (0.00274)	0.00117*** (0.000165)	0.00232* (0.000988)	0.0223*** (0.00428)	0.00652*** (0.00115)	0.0702*** (0.00813)	0.0245*** (0.00300)
_cons	-285.9 (281.9)	7.969 (20.96)	177.1 (220.5)	-485.8 (478.4)	-62.26 (139.9)	820.6 (807.6)	828.9 (1090.0)
lambda							
_cons	0.498 (0.510)	0.394 (0.500)	0.646 (0.355)	0.516 (0.476)	0.365 (0.572)	0.249 (0.670)	0.677* (0.339)
sigma							
_cons	849.6*** (167.9)	88.30*** (15.93)	472.4*** (128.7)	1461.5*** (290.4)	653.6*** (194.9)	4329.0*** (965.2)	2079.0*** (628.5)

Note: „Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ ”

Source: Own data processing using the econometric package Stata 16.

The results of the spatial error econometric model support the same movement of indicators specific to international labor migration, similar to the results obtained by the spatial lag run, with the results having predominantly a high level of significance but not a major influence on the dependent variables.

Table 5. Spatial lag and Spatial error model results of the shaping factors of emigration and immigration in EU-27 countries

	(1) EM Spatial lag	(2) EM Spatial error	(3) IM Spatial lag	(4) IM Spatial error
GDP_C	-1.172* (0.518)	-1.056 (1.101)	-1.384** (0.460)	-1.487 (0.822)
TEA	540.4 (775.2)	508.1 (1326.5)	780.9 (640.5)	794.6 (804.7)
PR	2180.5 (1389.8)	2859.9 (2234.9)	666.9 (1076.5)	1947.0 (1015.5)
AME	8.067 (5.191)	11.58 (9.458)	8.368 (4.643)	14.21 (7.567)
EFB_SK_T	31.43 (95.70)	-8.957 (245.3)	177.7 (93.13)	171.3 (168.3)
EFB_SK_I	511.4*** (67.12)	590.4** (216.6)	456.8*** (61.24)	535.4*** (103.6)
FBP_TFJ	-107.1*** (17.19)	-105.0* (42.15)	-70.23*** (14.05)	-51.65 (31.17)
FBP_CSK	-20.99 (66.98)	-2.666 (153.8)	-86.12 (63.17)	-88.96 (112.4)
FBO_PSK	-13.59 (25.85)	-64.57 (102.5)	-27.37 (22.45)	-77.43 (48.23)

	(1) EM Spatial lag	(2) EM Spatial error	(3) IM Spatial lag	(4) IM Spatial error
ER_JS_MS	8.037*** (1.549)	13.05*** (2.749)	9.842*** (1.518)	15.27*** (1.728)
ER_JS_MS_H	1.143 (4.623)	7.597 (19.64)	0.716 (3.406)	5.566 (7.115)
_cons	-103306.0** (33815.3)	-93805.5 (54843.0)	-91104.4* (38054.9)	-87876.1 (47138.3)
rho				
_cons	0.844*** (0.141)		0.659** (0.202)	
sigma				
_cons	17943.2*** (3740.2)	18990.3* (7701.1)	15218.5*** (2300.2)	13815.3*** (2697.9)
lambda				
_cons		-2.569 (4.481)		-3.155** (1.191)

Note: „Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ ”

Source: Own data processing using the econometric package Stata 16.

The analysis of the selected variables includes results showing significant increases in the dependent variables, represented by the number of emigrants and the number of immigrants, respectively, with the upward movement by one unit of the number of foreign-born employees by skill level whose educational attainment increased (EFB_SK_I) and the number of employed migrants by job satisfaction (ER_JS_MS). On the other hand, the number of emigrants and immigrants decreases with the influence of the foreign-born population who managed to find a job in less than 3 months in the host country.

Results of the network analysis through Gaussian Graphical Models (GGMs)

The network analysis was employed in the current study through the use of Gaussian Graphical Models (GGMs), estimated by the Bayesian method (EBICglassso) (Figure 1) and partial correlations method (PCOR) (Figure 2).

Main findings entailed significant positive links and interdependencies between some indicators, particularly between the number of immigrants and emigrants and the number of foreign-born employees by skill level and the foreign-born employed population with proficient skill level. At the same time, significant but negative linkages in the variables were found between poverty risk, average monthly income, and the share of tertiary educated people.

The network analysis also shows a positive, significant relationship between GDP per capita and average monthly income, i.e. between the number of migrants and the number of migrants from host countries. Negative, but significant, interdependencies and links can be observed between employment and unemployment rates across EU Member States.

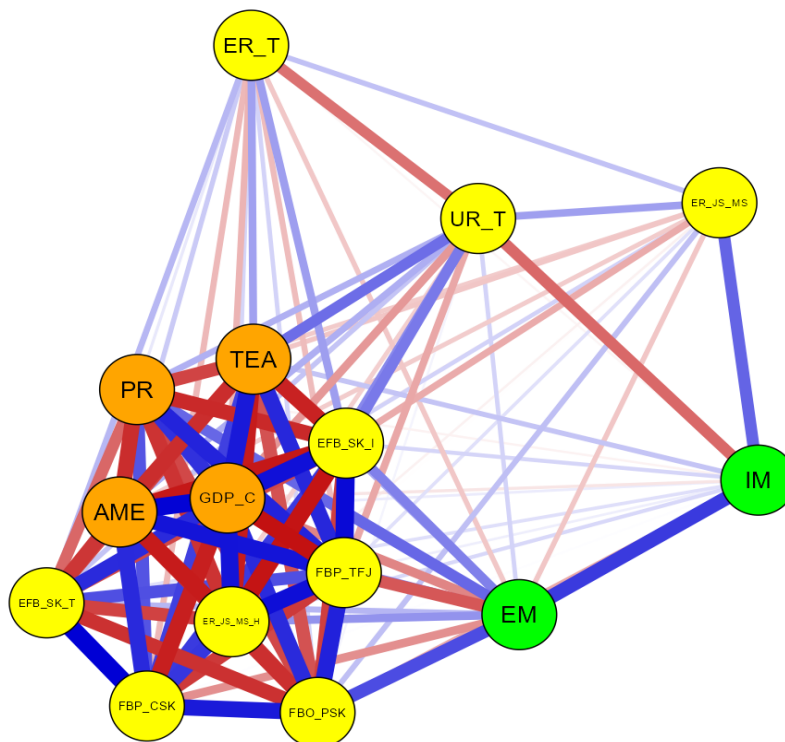


Figure 1. Network analysis – Gaussian Graphical Model estimated by the Extended Bayesian Information Criteria - EBICglasso, EU-27, 2021

Source: Own data processing using the JASP platform.

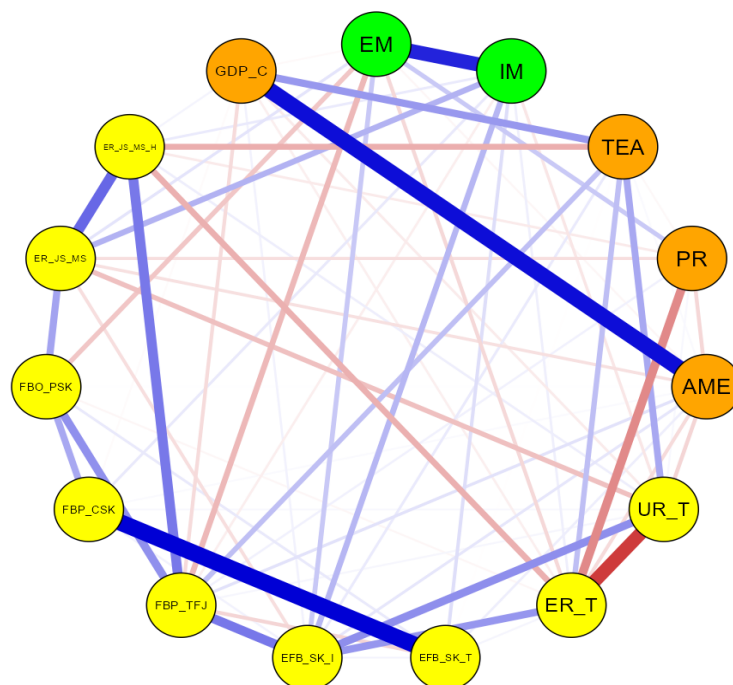


Figure 2. Network analysis – Gaussian Graphical Model estimated by partial correlations - PCOR, EU-27, 2021

Source: Own data processing using the JASP platform.

The network analysis's findings highlight the significance of soft and digital skills, which both native-born people and migrants must recognize to thrive in the worldwide job market and economy. Managers place a great value on the talents that employees of the future will need to possess. By 2025, flexibility, stress tolerance, and critical thinking and analysis will be the most crucial abilities (European Commission, 2023). Enhancing educational initiatives that should go beyond information delivery as a sole focus could be one way to overcome these obstacles. Education personnel should adhere to the goals of the EU education plan and promote lifelong learning. To ensure that teachers receive training and that more educators are engaged in teaching, the government must allocate more funds to the education sector. It is via improved dissertation writing supervision that analytical skills are developed. Other studies that suggest the funding model of industrialized European nations like the UK is also in favor of better public support for higher education in Romania (Simionescu, 2022).

Better healthcare, transportation, and public services benefit society as a whole, but this ecosystem also benefits the labor market because it needs highly skilled human capital to develop innovative goods and services in areas where the EU is competitive (high value-added sectors, cyber security, transport, machinery, agriculture, transport, green economy, health). More funding is required in this situation for innovation, research, and development, including the establishment of centers of research excellence. But the competent labor force in this industry needs not just digital skills but other critical abilities and proficiencies as well (Simionescu, 2022).

Conclusion

This essay examined the unique characteristics of the (digital) labor market and emphasized how the pandemic crisis has affected both worldwide migration and domestic labor markets. Due to the social distancing measures that governments have imposed to combat the virus, there has been a growing emphasis on the digitized labor market, and e-commerce, as well as an ongoing shift in consumer preferences for goods and services. These factors have had a significant impact on employment, unemployment, and how people work.

In addition to providing a foundation for future opinions and assessments on the development and effects of international labor migration in the European Union, particularly in Romania, the study's findings can help policymakers in the years to come by outlining and providing examples of the particular components of jobs and employees, with an emphasis on the qualifications and essential skills of both native-born workers and migrants seeking employment.

The well-known previous positive impacts, modern advances, and digitization can lead to expanded disparity, compounding work frailty, and dangers to the accessibility of satisfactory work openings. In the future, labor-based action is anticipated to decrease amid the expanding utilization and improvement of digital advances. Indeed, within the setting of mechanization of routine exercises, it will be conceivable to preserve the long-term adjustment within the labor advertise by making a huge number of modern employments. Schlogl and Sumner (2020) have highlighted that more than 60% of occupations in creating nations are vulnerable to robotization. Understanding the connection between digitization, work misfortune, and unemployment subsequently becomes imperative, particularly as digitization is emphatically related to the level of financial improvement.

While the advancement of technology is a relative certainty, it is not clear how it might affect individuals' lives, especially their working lives. What technology has done for work has been revolutionary, and innovative, enabling the rapid transfer of files, information, and financial transfers to any corner of the world within minutes, as well as advanced, extensive

telecommunications, virtual meetings, and the possibility of re-entering work into the private space of the family, as was often the case in pre-industrial times.

The main limitations of the current research may include the relatively reduced number of observations in the dataset because of the timeline considered in our research (2021) to capture both the Covid-19 pandemic inferences and geopolitical conflicts in Europe. Future research directions will explore a larger timeline and an extended set of indicators more prone to capture the amplitude of the migration phenomenon.

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