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Is It Perception or Reality that International Migration Flows Increase Unemployment? An Empirical Assessment for the European Countries

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Abstract

This paper mainly aims to explore the long-term impact of net migration on unemployment in the 11 European countries for the period 1991–2022 employing the cross-sectionally augmented distributed lag (CS-DL) estimator. In addition, the Juodis, Karavias and Sarafidis panel Granger non-causality test (JKS test), a new technique, is employed to explore causal links between variables. According to the findings of the CS-DL estimator, net migration has no statistically significant effect on unemployment in the long-term. This result does not support the perception that migration increases unemployment. The findings of the JKS test also indicate that there is no causal link from net migration to unemployment, but unemployment is a cause of migration. When evaluated in terms of unemployment, the empirical result implies that the selected European countries follow a rational immigration policy.

Keywords: Economic growth, immigration, unemployment, panel causality
JEL Classification: E24, F22, O47

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1. Introduction

People need to work in order to meet their basic needs and reach a certain standard of living (Linn *et al*., 1985). Serious mental and physical problems may occur in individuals who are unemployed despite their ability and willingness to work (Wilson and Walker, 1993). The main mental health problems caused by long-term unemployment include stress, depression, anxiety disorders, panic attacks and lack of self-confidence (Tapia *et al*., 2018). These diseases may even be caused in suicide cases (Milner *et al*., 2013). On the other hand, the psychology of unemployment may lead to negative behaviors like excessive alcohol consumption, smoking, substance abuse, unbalanced diet, insomnia and low physical activity. These negative behaviors may be associated with diseases such as high blood pressure, heart attack, diabetes, stroke, cancer and even premature death in unemployed individuals (Sanchez Rico *et al*. 2023).

Unemployment produces not only personal but also social and economic problems (Pohlan, 2019). One of the important social consequences of unemployment is that it increases the tendency to commit crime. As a matter of fact, some unemployed individuals may turn to illegal activities in order to survive and/or due to mental disorders (Britto *et al*., 2022). In addition, children of unemployed individuals cannot benefit from education and health services sufficiently (Fuller-Thomson *et al*., 2013). Moreover, unemployment has effects on aspects of family life such as domestic violence, divorces, marriage and fertility rates (Kalleberg and Von Wachter, 2017). Poverty and inequality are natural and serious problems associated with unemployment (Saunders, 2002).

Individual income, private consumption expenditure, national income, government expenditure, tax revenues, budget balance, labor force participation rate and resource allocation are among the economic indicators within the sphere of influence of unemployment. As a matter of fact, reduced individual income due to unemployment has a suppressive effect on private consumption expenditures (Fagereng *et al*., 2024). Moreover, underemployment can weaken a country's global competitiveness by widening the gap between potential output and actual output. Furthermore, social transfers such as unemployment benefits, which are used to minimize the individual and social costs of unemployment, impose additional burdens on the public sector. On the one hand, increased government expenditures due to social transfers and on the other hand, decreased tax revenues due to the decline in national income and expenditures may trigger budget deficits (Jahoda and Godarová, 2016). Unemployment also affects the allocation of human resources. Because some of the unemployed have to migrate to different regions or countries in order to find a job with better wages and working conditions (DaVanzo, 1978). This may lead to a change in both demographic structure and resource allocation.

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While the economic and political borders of countries were almost the same during the era of nation states, the waves of globalization have largely eliminated economic borders and accelerated the movement of not only goods and services but also factors of production between countries (Harris, 2003). This transition from closed to open economies has brought about important debates in terms of its consequences. One of these is the impact of labor mobility on unemployment. As a matter of fact, due to wages, working conditions, economic or political fluctuations, labor migrates especially towards some developed and developing countries. This situation affects labor force indicators in both receiving and sending countries. However, there is no consensus on the direction of the effect of immigration on unemployment. This is because the skills of immigrants, the skills of native workers and the economic structure of the receiving country can change the effect of immigration on unemployment (Ruhs and Vargas-Silva, 2014).

According to the lump of labor fallacy, which asserts that the quantity of jobs in an economy is fixed, hiring an immigrant means that a native worker loses a job opportunity (Fingleton *et al*., 2020). However, what is important here is whether migrants are substitutes or complements of native workers (Dustman *et al*., 2005; Viseth, 2020). In a country where the informal economy is widespread and the minimum wage is not binding, especially unskilled migrants are excellent substitutes for native workers (Abdulloev *et al*., 2011; Delgado-Prieto, 2022). On the other hand, if workers are complementary, immigrants can create job opportunities for native workers. This is because unskilled migrants reduce costs and increase supply. As a result, the demand for skilled workers may increase. For example, migrant construction workers increase the number of houses produced and sold by lowering housing production costs. This means new job opportunities for skilled local workers such as engineers, contractors, architects and electricians (Wolla, 2014).

Nathan (2014) points out that people migrate not only as workers but also as entrepreneurs and investors. Therefore, immigrants may have financial, social and network capital as well as human capital. In this context, while some highly skilled immigrants start technology companies, some unskilled immigrants are forced to start their own businesses because they have no other options (OECD, 2010). Both types of entrepreneurships may help reduce unemployment, but the former is considered to have a greater impact on unemployment. Immigrant-owned businesses also create new employment opportunities for natives (CFE, 2014; Lofstrom and Wang, 2019). Many policymakers in the US believe that immigrant entrepreneurs act as a lever for economic growth and job creation. The fact that more than half of the entrepreneurs in Silicon Valley are immigrants is directly related to the importance attached to them (Kerr and Kerr, 2016).

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Today, especially developed countries are facing an intense flow of migration. Indeed, international migrant flows increased by 83% from 153 million in 1990 to 281 million in 2020 (Migration Data Portal, 2024). According to estimates by the ILO (2021), the number of international migrant workers reached 169 million in 2019. This is equivalent to 4.9% of the worldwide labor force. It is also noted that Europe and Central Asia are the regions with the highest concentration of migrant workers with a share of 37.7%. In such an environment, both policymakers and researchers are looking for an answer to the question of whether immigrants increase unemployment in the host country. In addition to migration, other basic variables affecting unemployment include economic growth, inflation, labor productivity, public spending, and investments. Theoretically, it is accepted that economic growth contributes to a decrease in unemployment by stimulating investment. Indeed, Okun's Law also suggests that an increase in the growth rate will reduce unemployment (Al-Kasasbeh, 2022). However, there are different assessments regarding the effect of inflation on unemployment. The risks and uncertainties caused by high inflation can contribute to an increase in unemployment by negatively affecting economic growth (Pappas and Boukas, 2025). However, on the other hand, since the quantity of production is a positive function of price, inflation may cause unemployment to decrease by encouraging production (Masoud, 2025). As with inflation, there are also two different perspectives in economic theory regarding the impact of public spending on unemployment. The classical approach accepts that public intervention distorts the allocation of resources and harms growth and unemployment, while the Keynesian approach assumes that underemployment can be overcome through such interventions (Doğaner, 2023).

This paper focuses on investigating whether the perception that immigrants increase unemployment is true or not using the CS-DL estimator in 11 selected European countries for the period 1991–2022. Some developed European countries are chosen as a sample because Europe is one of the main regions where people want to migrate due to better wages and working conditions as well as the quality of prosperity and democracy. This paper makes a contribution to the current literature in a few ways. First, although European countries are among the most important destinations for migrants, there are very few panel data studies investigating the relationship between unemployment and net migration for these countries. Second, this paper not only estimates cointegration and long-term coefficients but also analyzes causal relationships with the help of advanced techniques. Econometric findings are important in terms of revealing whether the view that international migration increases unemployment is a perception or a reality. The remainder of this study is arranged as follows: In Section 2, a literature review is presented. Section 3 introduces the data description, model specification and the econometric methodology used. Section 4 summarizes the econometric findings while Section 5 concludes the paper.

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2. Review of Literature

Especially in recent years, there has been a perception that immigrants cause unemployment due to the increasing wave of international migration. In order to test the accuracy of this perception, some researchers analysed it with the help of econometric techniques in various countries. But it is worth noting that the number of such studies is quite limited. Summarized information about the studies we were able to access is as follows:

Boubtane *et al*. (2013) researched the relationship between immigration and unemployment for 22 OECD countries by employing panel VAR technique over the period 1987–2009. The variables are unemployment, migration, GDP per capita, employment, native-born unemployment, and foreign-born unemployment. Econometric findings reveal that there is a bidirectional negative association between migration and the total unemployment rate in the host country. Fromentin (2013) explored the effect of immigration on unemployment in France by using cointegration tests and an error correction model based on data covering the period 1970–2008. The variables are unemployment, migration, GDP per capita, and wages. The results of cointegration tests show that there is a negative link between net immigrant inflows and unemployment. Chamunorwa and Miambo (2014) analyzed the impact of immigration on unemployment for South Africa by applying ordinary least squares method through data covering the period 1980–2010. The variables include unemployment, migration, GDP per capita, and inflation. According to the coefficient estimates, immigration affects unemployment positively and significantly. Škuflić and Vučković (2018) investigated the effect of emigration on unemployment rates in 9 selected European Union countries using a fixed effects model for the period 2004–2015. The variables examined in relation to each other are unemployment, migration, GDP per capita, and labor market policies. According to their findings, emigration leads to a rise in unemployment in sending countries. Aslan and Altınöz (2020) examined the link between unemployment and immigration in the US by applying the ARDL technique and Toda-Yamamoto non-linear and linear causality tests with data covering the period 1980–2013. The variables consist of unemployment and migration. The ARDL technique shows that immigration positively affects unemployment in the long-term. However, the linear and non-linear causality estimates suggest that there is no causal link between immigration and unemployment.

Esposito *et al*. (2020) tested whether immigration has an effect on unemployment in 15 European Union (EU) countries through the error correction model (ECM) for the period 1997–2016. The variables used can be listed as unemployment, GDP, and migration. According to the obtained findings, in the long-term, immigration reduces unemployment in all peripheral EU countries. Gündoğmuş and Bayır (2021) explored the influence of international

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migration on unemployment for 27 European countries using the Driscoll and Kraay estimator based on data over the period 2000–2017. The variables consist of unemployment, migration, GDP, public expenditure, education expenditure, and wages. The empirical findings suggest that international migration has no statistically significant impact on unemployment. Sengupta and Mihalache (2021) examined the nexus between immigration and unemployment in a sample of 33 OECD countries using PECM, fully modified OLS (FMOLS) and panel dynamic OLS (PDOLS) methods. The variables include unemployment, migration, and GDP. Empirical estimates indicate that immigration reduces unemployment in both the short and long-term. Cebeci Mazlum (2022) examined whether migration has an effect on unemployment in G7 countries using panel ARDL technique with the help of data for the period 2001–2019. The variables are unemployment and migration. Based on the findings, it is stated that migration reduces unemployment.

Yılmaz and Günel (2022) researched the association between immigration and unemployment in 10 European countries by performing the Fourier Toda Yamamoto causality test on the basis of data covering the period 1990–2019. The variables used in the analysis are migration and unemployment. The findings revealed that there is a causal association between migration and unemployment across the panel. Dritsaki and Dritsaki (2024) analyzed the linkage between migration and unemployment in 27 EU countries during the period 1990–2020 by applying a multivariate panel Granger causality test. The net migration rate, GDP per capita, and unemployment rate constitute the set of variables for the analysis. The causality estimates indicate that there is a bidirectional link between these variables in the long run.

3. Data, Model and Methodology

In order to create a balanced panel and to estimate the long-term effects of migration on unemployment more reliably using a data set covering a broad period, the sample was limited to the 11 countries (Denmark, Finland, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Slovenia, Sweden, Switzerland in Europe that receive the most migrants. The data spans the period 1991–2022, with migration data obtained from the Statistical Office of the European Union (Eurostat) and other data sourced from the World Bank's World Development Indicators (WDI). The variables used in the analyses, their symbols, units of measurement and sources are displayed in Table 1.

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Table 1: Data description

Variable	Symbol	Unit of measurement	Source
Unemployment	UN	Unemployment, total (% of total labor force)	WDI
Net Migration	NM	Difference between immigrant numbers and emigrant numbers	Eurostat
Economic Growth	GDP	GDP (constant 2015 US$)	WDI
Inflation	INF	Consumer price index (2010 = 100)	WDI
Labor Productivity	PR	GDP per person employed (constant 2021 PPP $)	WDI
Government Expenditure	GOV	General government final consumption expenditure (% of GDP)	WDI
Investment	INV	Gross fixed capital formation (constant 2015 US$)	WDI

Source: Authors' own elaboration

Since this study mainly investigates whether immigration has an impact on unemployment, unemployment is taken as the dependent variable. On the other hand, independent variables include economic growth, inflation, labor productivity, government expenditures and fixed capital formation, which are considered to be among the determinants of unemployment. These variables were selected from among the basic determinants that do not have a multicollinearity problem.

In this context, the functional relationship is as follows:

$$UN = f(NM, INF, GDP, PR, GOV, INV) \tag{1}$$

The econometric form of the model is given below:

$$UN_{i,t} = \alpha_i + \beta_1 NM_{i,t} + \beta_2 INF_{i,t} + \beta_3 GDP_{i,t} + \beta_4 PR_{i,t} + \beta_5 GOV_{i,t} + \beta_6 INV_{i,t} + \varepsilon_{i,t} \tag{2}$$

where α denotes the intercept, β's indicates the slope coefficients of the independent variables, i shows the cross-sectional unit, t represents the time period and $\varepsilon_{i,t}$ symbolizes the error term. The parameters in the model are estimated using the original values of the variables.

In this paper, advanced econometric techniques are employed to analyze the association between immigration and economic growth. In this context, firstly, cross-sectional dependence and homogeneity of slope coefficients are tested to determine appropriate

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techniques. In line with the findings of cross-sectional dependence and homogeneity tests, second generation unit root and cointegration tests are applied. The long-term effect of immigration on unemployment is estimated using estimators robust to cross-sectional dependence and heterogeneity. Finally, causal linkages between variables are examined by performing the JKS test.

3.1 Cross-Sectional Dependence Test

With the globalization process, economic interaction among countries has reached significant dimensions. This makes a country more vulnerable to economic shocks in other countries. In panel data analysis, the existence of such interaction between countries should be tested. Because ignoring cross-sectional dependence may lead to biased, erroneous and unrealistic forecasts (Chou, 2013; Gyamfi *et al*., 2022). Different techniques are used to determine whether there is cross-sectional dependence. One of them is the LM test developed by Breusch and Pagan (1980) and formulated as follows:

$$\text{Breusch–Pagan LM test} = T\sum_{i=1}^{N-1}\sum_{J=i+1}^{N}\hat{\rho}_{ij}^{2} \tag{3}$$

where T is the time dimension and N is the number of cross-sectional units. In addition, $\hat{\rho}_{ij}$ is a sample estimate of the cross-sectional correlation of the residuals from individual OLS estimates (Pesaran *et al*., 2008). The Breusch–Pagan LM test is usually preferred when the cross-sectional dimension (N) is finite, and the time dimension (T) is infinite. In other words, this test is more appropriate when $T > N$ (Hamrita and Mekdam, 2016).

Pesaran (2004) argues that the power of the Breusch–Pagan LM test will weaken as the number of cross-sections increases and the time dimension decreases. Therefore, he developed the following scaled version of the LM test for the $N > T$ case (Baghirov *et al*., 2022):

$$\text{Pesaran scaled LM test} = \sqrt{\frac{1}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}(T\hat{p}_{ij}^{2}-1) \tag{4}$$

Baltagi *et al*. (2012) developed the bias-corrected scaled LM test to investigate cross-sectional dependence in a fixed-effects homogeneous panel data. This test, which is suitable when $N \to \infty$ and $T \to \infty$, is as follows:

$$\text{Bias-corrected scaled LM test} = \sqrt{\frac{1}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{J=i+1}^{N}\left(T\hat{\rho}_{ij}^{2}-1\right)-\frac{N}{2(T-1)} \tag{5}$$

According to Pesaran (2004), the Breusch–Pagan LM test is incomplete when N is large. Therefore, instead of the squares used in the LM test, the following test with pairwise correlation coefficients is suggested (Pesaran, 2004):

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$$\text{Pesaran CD} = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \quad (6)$$

The Pesaran CD test is particularly applicable to heterogeneous dynamic models with structural breaks (Jalil, 2014; Sarafidis *et al*., 2009).

3.2 Slope Heterogeneity Test

In addition to cross-sectional dependence, it is also useful to test whether the slope coefficients are homogeneous to determine appropriate econometric techniques (Dahmani *et al*., 2022). The homogeneity/heterogeneity of slope coefficients was first investigated by Swamy (1970), and later Pesaran and Yamagata (2008) developed the following delta (Δ) tests based on the Swamy statistic (Wei and Lihua, 2023):

$$\hat{\Delta} = \sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{2k}}\right) \quad (7)$$

$$\hat{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{\frac{2k(T-k-1}{T+1}}}\right) \quad (8)$$

where $\tilde{S}$ denotes the Swamy statistic and k symbolizes the number of explanatory variables (Bekele, *et al*., 2024). The first one is the delta test for large samples, and the second one is the adjusted delta test for small samples (Baghirov and Sarkhanov, 2023).

Blomquist and Westerlund (2013) argue that the Pesaran and Yamagata Δ tests cannot deal with heteroskedasticity and/or autocorrelation problems and propose a delta HAC (Δ_{HAC}) test that incorporates these features. The Δ_{HAC} test based on the delta test can be formulated in the following way:

$$\Delta_{HAC} = \sqrt{N}\left(\frac{N^{-1}S_{HAC}-k}{\sqrt{2k}}\right) \quad (9)$$

where S_{HAC} is calculated as follows:

$$S_{HAC} = \sum_{i=1}^{N} T\left(\hat{\beta}_i - \hat{\beta}\right)'\left(\hat{\theta}_{i,T}\hat{V}_{i,T}^{-1}\hat{\theta}_{i,T}\right)\left(\hat{\beta}_i - \hat{\beta}\right) \quad (10)$$

$$\hat{\beta} = \left(\sum_{i=1}^{N} T\hat{\theta}_{i,T}\hat{V}_{i,T}^{-1}\,\hat{\theta}_{i,T}\right)^{-1}\sum_{i=1}^{N}\hat{\theta}_{i,T}\hat{V}_{i,T}^{-1}\,X_{i,T}'M_{\tau}y_i \quad (11)$$

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3.3 Panel Unit Root Test

Since non-stationary series may lead to spurious regression problem, unit root test is applied before econometric model estimation (Khalid *et al*., 2021). In the presence of cross-sectional dependence, the stationarity of variables is examined through unit root tests that are robust against cross-sectional dependence. Therefore, cross-sectionally ADF (CADF) test, one of the second-generation unit root tests, is employed in this study.

The formula for the CADF test is as follows:

$$\Delta y_{it} = \alpha_i + \gamma_i y_{it-1} + \delta_i \bar{y}_{t-1} + \beta_i \Delta \bar{y}_t + \varepsilon_{it} \tag{12}$$

To eliminate the cross-sectional dependence problem, the standard ADF test is extended by adding the means of lagged levels $(\bar{y}_t)$ and first differences $(\Delta \bar{y}_t)$ of individual series (Pesaran, 2007).

3.4 Panel Cointegration Test

The cointegration test is performed to check for the presence of a long-term association between variables. In this study, the Westerlund (2007) test was employed because it is robust to cross-sectional dependence and heterogeneity of slope coefficients and also takes into account the mixed integration order (Xie and Jamaani, 2022). Westerlund (2007) developed group mean tests with G_t and G_a statistics and panel tests with P_t and P_a statistics to check whether there is a long-run relationship between variables.

The group mean statistics are calculated as follows:

$$G_t = N^{-1} \sum_{i=1}^{N} \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)} \mathrm{T} \tag{13}$$

$$G_a = N^{-1} \sum_{i=1}^{N} \frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \tag{14}$$

If the null hypothesis is rejected for the group mean statistics, it is accepted that there is cointegration in at least one cross-sectional unit. Panel statistics are computed as follows:

$$P_t = \frac{\hat{\alpha}}{SE(\hat{\alpha})} \tag{15}$$

$$P_a = T\hat{\alpha} \tag{16}$$

For panel statistics, rejection of the null hypothesis means that there is cointegration in the whole panel.

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3.5 Long-Term Estimation

Due to the presence of cross-sectional dependence, heterogeneity, and a mixture of I(0) or I(1) variables in our panel, we prefer the CS-DL approach, which is one of the estimators structured to overcome these problems. The CS-ARDL, CS-ECM, CCEMG and AMG estimators were also employed for robustness checks. The CS-DL estimator, like the CS-ARDL estimator, is derived from the panel ARDL approach.

The CS-ARDL estimator is obtained by averaging the dependent and independent variables across units and using lagged values of both the dependent and independent variables (Daştan *et al*., 2020). It can be formulated as follows (Ditzen, 2021):

$$y_{it} = \alpha_i + \sum_{l=0}^{p_y} \delta_{il} y_{it-1} + \sum_{l=0}^{p_x} \beta_{il} x_{it-1} + \sum_{l=0}^{p} \lambda_{il} \bar{z}_{t-1} + \varepsilon_{it} \quad (17)$$

The long-term coefficients of the model are calculated with the help of the formula below:

$$Q_{CS-ARDL} = \frac{\sum_{l=0}^{p_x} \hat{\beta}_{il}}{1-\sum_{l=1}^{p_y} \hat{\delta}_{il}} \quad (18)$$

The CS-ARDL estimator may control cross-sectional dependence, endogeneity, and heterogeneity. In addition, it can make robust estimates in I(0) and I(1) combinations of variables (Voumik *et al*., 2023). However, to make consistent estimations with CS-ARDL, long lags are needed. Otherwise, the obtained results may be biased in panels with small time dimension. Therefore, Chudik *et al*. (2016) argue that the CS-DL estimator may be more reliable than alternative panel ARDL estimators, especially in the 30–50 range where the time dimension is not very long.

The CS-DL estimator is obtained by taking the averages of the independent and dependent variables according to the units and using only the lagged values of the independent variable and can be written as follows (Daştan *et al*., 2020):

$$y_{it} = \alpha_i + \beta_{1i} x_{it} + \sum_{l=0}^{p_{x-1}} \gamma_{il} \Delta x_{it-1} + \sum_{l=0}^{p_{\bar{y}}} \delta_{y,il} \bar{y}_{t-1} + \sum_{l=0}^{p_{\bar{x}}} \delta_{x,il} \bar{x}_{t-1} + \varepsilon_{it} \quad (19)$$

Unlike the CS-ARDL model, the CS-DL estimator calculates the long-term coefficients without estimating the short-term coefficients (Chakraborty and Mazzanti, 2021). The CS-DL and CS-ARDL estimators take into account the three basic elements of panel data: dynamics, cross-sectional dependence, and heterogeneity (Sohail *et al*., 2023). For this reason, Chudik *et al*. (2016) argue that the CS-DL estimator is not superior to the CS-ARDL technique. In other words, these estimators are complements rather than substitutes.

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3.6 Panel Causality Test

Juodis *et al*. (2021) developed a new technique, called the JKS test, to test the null hypothesis of no Granger causality in homogeneous or heterogeneous models. This technique allows for heterogeneity and cross-sectional dependence. Moreover, unlike the Dumitrescu–Hurlin panel causality test, it can be applied to an unbalanced panel (Simionescu and Schneider, 2022). Since the null hypothesis of the JKS test assumes that all Granger causality parameters are equal to zero, *i.e.* homogeneous, it is considered an innovative technique (Oyadeyi *et al*., 2024). It outperforms existing tests because it allows the use of a pooled fixed effect estimator with a relatively faster convergence rate for these parameters only. In addition, the Half-Panel Jacknife technique is applied to reduce the Nickell bias of the pooled estimator. The basic form of the JKS test is based on the following model (Xiao *et al*., 2023):

$$y_{it} = \alpha_{0,i} + \sum_{p=1}^{p} \alpha_{p,i} y_{i,t-p} + \sum_{p=1}^{p} \beta_{p,i} x_{i,t-p} + \varepsilon_{it} \tag{20}$$

The null hypothesis that x_{it} does not Granger cause y_{it} is tested.

4. Findings

We start with correlation analysis to get preliminary information about the direction and strength of the link between the variables. According to Table 2, labor productivity and investment have a negative and statistically significant correlation with unemployment. On the other hand, economic growth and government expenditure are positively and significantly correlated with unemployment. However, net migration and unemployment are not significantly correlated.

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Table 2: Correlation matrix

Variable	*UN*	*NM*	*INF*	*GDP*	*PR*	*GOV*	*INV*
UN	1.0000						
NM	−0.0501 (0.3491)	1.0000					
INF	−0.0674 (0.2071)	0.1577*** (0.0030)	1.0000				
GDP	0.1366** (0.0103)	0.6910*** (0.0000)	0.1504*** (0.0047)	1.0000			
PR	−0.2255*** (0.0000)	−0.0633 (0.2364)	0.3048*** (0.0000)	−0.0854 (0.1097)	1.0000		
GOV	0.1386*** (0.0092)	0.0041 (0.9385)	0.1242** (0.0197)	−0.0667 (0.2118)	−0.3890*** (0.0000)	1.0000	
INV	−0.3479*** (0.0000)	−0.0343 (0.5208)	−0.0300 (0.5751)	−0.1053** (0.0483)	−0.0651 (0.2233)	−0.3335*** (0.0000)	1.0000

Note: ** and *** denote statistical significance at the 5%, and 1% levels, respectively.

Source: Authors' own calculations

Secondly, we calculated the variance inflation factor (VIF) and tolerance values (1/VIF) to examine whether there is a multicollinearity problem among the variables. As seen in Table 3, it can be said that there is no multicollinearity problem among the variables since VIF values are less than 10 and 1/VIF values are greater than 0.1 (Wang *et al*., 2023).

Table 3: VIF test

Variable	VIF	1/VIF
NM	1.95	0.514067
INF	1.29	0.773995
GDP	2.07	0.483511
PR	1.57	0.636351
GOV	1.62	0.615614
INV	1.26	0.795197
Mean VIF	1.63	

Source: Authors' own calculations

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The result of cross-sectional dependence plays a decisive role in the choice of the unit root test, cointegration method, coefficient estimator and causality technique to be applied. Therefore, in the third stage, we checked for cross-sectional dependence through four different statistics. All test statistics reported in Table 4 indicate the presence of cross-sectional dependence.

Table 4: Results of cross-sectional dependence

Variable	Breusch–Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
UN	294.9195*** (0.0000)	21.82662*** (0.0000)	21.64920*** (0.0000)	9.458252*** (0.0000)
NM	619.2991*** (0.0000)	52.75500*** (0.0000)	52.57758*** (0.0000)	22.14808*** (0.0000)
INF	837.8124*** (0.0000)	73.58942*** (0.0000)	73.41201*** (0.0000)	19.66581*** (0.0000)
GDP	262.4065*** (0.0000)	18.72663*** (0.0000)	18.54921*** (0.0000)	11.82846*** (0.0000)
PR	1,642.113*** (0.0000)	150.2765*** (0.0000)	150.0991*** (0.0000)	40.50002*** (0.0000)
GOV	1,522.901*** (0.0000)	138.9100*** (0.0000)	138.7326*** (0.0000)	38.80589*** (0.0000)
INV	1,216.032*** (0.0000)	109.6513*** (0.0000)	109.4739*** (0.0000)	33.15289*** (0.0000)

Note: *** denotes statistical significance at the 1% level.
Source: Authors' own calculations

In the presence of cross-sectional dependence, there is a possibility that the slope coefficients in the panel may be heterogeneous (Boundi-Chraki, 2023). Fourth, we investigate the heterogeneity of the slope coefficients with the help of Pesaran and Yamagata (2008) test and Blomquist and Westerlund (2013) test. The statistics of both tests in Table 5 confirm the rejection of the null hypothesis that the slope coefficients are homogeneous.

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Table 5: Results of heterogeneity test

	Pesaran and Yamagata (2008)		Blomquist and Westerlund (2013)	
	Test Value	***p*-value**	**Test Value**	***p*-value**
$\hat{\Delta}$	15.779***	0.000	12.914***	0.000
$\hat{\Delta}_{adj}$	18.220***	0.000	14.912***	0.000

Note: *** denotes statistical significance at the 1% level.
Source: Authors' own calculations

In the fifth stage, we investigated the stationarity of the series against the possibility of a spurious regression. For this purpose, we used the CADF test, which is robust to cross-sectional dependence. Table 6 shows that INV is stationary at level while all variables except INV are free from unit root in first differences.

Table 6: Results of panel unit root test

Variable	Without trend		With trend		Order
	Level	**1st Difference**	**Level**	**1st Difference**	
UN	–2.041	–4.041***	–2.666	–3.978***	I (1)
NM	–1.906	–4.444***	–2.177	–4.470***	I (1)
INF	–1.917	–3.136***	–1.826	–3.487***	I (1)
GDP	–1.251	–3.686***	–1.997	–3.899***	I (1)
PR	–1.670	–4.910***	–2.231	–4.910***	I (1)
GOV	–1.111	–4.368***	–1.416	–5.461***	I (1)
INV	–2.826***	–4.923***	–3.890***	–5.035***	I (0)

Note: *** indicates the 1% significance level.
Source: Authors' own calculations

Sixth, we analyzed whether there is a long-run relationship among the variables with the help of Westerlund (2007) technique, which is among the second generation cointegration tests. Table 7 shows the results of the cointegration test. According to these results, G_t and P_t statistics confirm the existence of cointegration relationship.

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Table 7: Results of panel cointegration test

Statistic	Value	*Z*-value	*p*-value	Robust *p*-value
G_t	-2.383	0.140	0.555	0.100*
G_a	-5.726	3.233	0.999	0.900
P_t	-7.444	-0.330	0.371	0.100*
P_a	-4.409	2.121	0.983	0.700

Note: * denotes statistical significance at the 10% level.
Source: Authors' own calculations

In the seventh step, to estimate the long-term impact of net migration, inflation, economic growth, labor productivity, government expenditure and investment on unemployment, we mainly used the CS-DL technique. This technique is robust to cross-sectional dependence and heterogeneity and can be applied to I(0) and I(1) combinations of variables. The outcomes of the coefficient estimates are reported in Table 8.

Table 8: Estimation results for the long-term equation

Variable	CS-DL	Robustness Check			
		CS-ARDL	CS-ECM	AMG	CCEMG
NM	−6.93e-06 (0.735)	−5.01e-07 (0.985)	−5.01e-07 (0.985)	−3.36e-06 (0.754)	−9.60e-06 (0.384)
INF	0.2129054* (0.068)	0.1712607 (0.166)	0.1712607 (0.166)	0.092117*** (0.004)	0.1640478* (0.067)
GDP	−2.28e-10** (0.038)	−2.32e-10** (0.031)	−2.32e-10** (0.031)	−1.22e-10* (0.099)	−8.82e-11 (0.434)
PR	0.0001078** (0.018)	0.0000438 (0.559)	0.0000438 (0.559)	0.0001714** (0.012)	0.0001532*** (0.003)
GOV	0.0684375 (0.776)	0.1291487 (0.661)	0.1291487 (0.661)	0.1750897 (0.274)	0.0452151 (0.800)
INV	−0.1059445 (0.484)	−0.1414719 (0.350)	−0.1414719 (0.350)	−0.1979823*** (0.008)	−0.147471** (0.035)

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' own calculations

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The calculated coefficient of net migration is negative but not statistically significant. This means that the perception that immigration increases unemployment is not valid for the sample in this study. This supports the findings of Gündoğmuş and Bayır (2021). Thus, as Boubtane *et al*. (2013) argue, our empirical findings do not confirm the main concerns about the negative impact of immigrants on employment opportunities for natives. In other words, taking into account emigrants, foreigners from other countries are not substitutes for the domestic labor force. Leaving aside its statistical significance, the sign of the coefficient of migration is somewhat similar to the findings of Boubtane *et al*. (2013), Fromentin (2013), Esposito *et al*. (2020), Sengupta and Mihaleche (2021), and Cebeci Mazlum (2022). On the contrary, this finding differs from Aslan and Altınöz (2020), Škuflić and Vučković (2018), Chamunorwa and Miambo (2014), who find that migration has a positive effect on unemployment.

The coefficient of inflation is positively related to unemployment at the 10% significance level. This implies that there is no trade-off relationship between inflation and unemployment and that price instability may harm not only economic balances but also social indicators such as unemployment. The direction of the effect of economic growth on unemployment may vary depending on the sources of growth. Our empirical estimations reveal that economic growth has a negative and significant effect on unemployment in the long-term. This result, which is consistent with Okun's Law, can be interpreted as economic growth has an employment-creating character. Labor productivity is another variable that has a significant effect on unemployment under the CS-DL estimator. The positive relationship between the variables can be explained by the fact that an increase in labor productivity reduces labor demand. On the other hand, the effect of government expenditure and investment is statistically insignificant. The estimators employed for robustness checks are consistent with the results of the CS-DL estimator in terms of the sign of the coefficients.

In the last stage, we analyzed the causality link among net migration, inflation, economic growth, economic growth, labor productivity, government expenditures and unemployment and investment by employing the JKS test. Table 9 summarizes the results of the causality test.

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Table 9: Results of JKS Granger non-causality test

H_0 Hypothesis	HPJ Wald Test	*p*-value	Direction Causality
NM ⇏ ***UN***	3.1120	0.5393	Unidirectional causality
UN ⇏ ***NM***	15.5861***	0.0036	
INF ⇏ ***UN***	132.4309***	0.0000	Bidirectional causality
UN ⇏ ***INF***	15.7656***	0.0034	
GDP ⇏ ***UN***	7.1003*	0.0688	Bidirectional causality
UN ⇏ ***GDP***	11.4129**	0.0223	
PR ⇏ ***UN***	3.9637	0.2654	Unidirectional causality
UN ⇏ ***PR***	22.5831***	0.0002	
GOV ⇏ ***UN***	33.2018***	0.0000	Bidirectional causality
UN ⇏ ***GOV***	47.7055***	0.0000	
INV ⇏ ***UN***	24.3963***	0.0001	Bidirectional causality
UN ⇏ ***INV***	14.9935***	0.0047	

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.Source: Authors' own calculations

According to the JKS test, there is no statistically significant causal relationship from migration to unemployment. This result is consistent with coefficient estimates to a certain extent. In contrast, there appears to be a significant causal relationship from unemployment to migration. Therefore, this finding can be interpreted as a cyclical unemployment may cause migration. However, results of Aslan and Altınöz (2020), Yilmaz and Günel (2022), and Dritsaki and Dritsaki (2024) are inconsistent with our findings.

The second finding of the causality test is the bidirectional relationship between inflation and unemployment. For instance, cost inflation caused by the increase in input prices may be a cause of the increase in unemployment by reducing aggregate supply. Therefore, it is important to ensure and maintain price stability in order to achieve the objectives of economic policies, including reducing unemployment. On the other hand, an increase in the unemployment rate may become one of the causes of the change in the general level of prices by decreasing aggregate demand.

Similarly, a bidirectional causality relationship was found between economic growth and unemployment. According to this result, which is also consistent with economic theory, growth performance is accepted as one of the causes of unemployment. In this con-

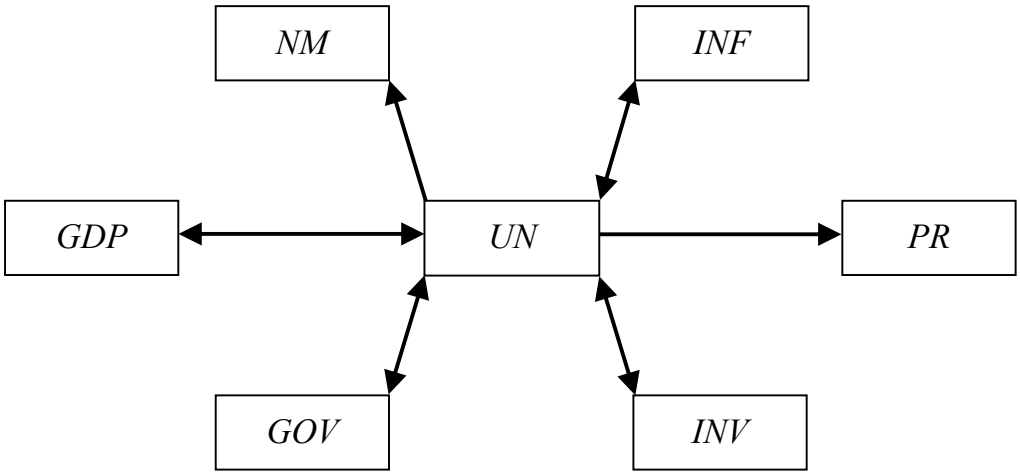
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text, an economic growth process characterized by more investment and job creation may help to reduce unemployment rates. In addition, fluctuations in labor factor employment can also be said to have a determining role in terms of economic growth. The fourth finding of the causality test points to a unidirectional relationship from unemployment to labor productivity. In an environment with high unemployment rates, employees may show more effort to keep their jobs. This may turn unemployment into a cause of productivity.

According to the sixth finding of the causality analysis, there is a bidirectional causal link between government expenditure and unemployment. This implies that unemployment affects the size and composition of government expenditure. This is because governments may have to intervene with expenditure policies to reduce unemployment or the poverty and income inequality caused by unemployment. At the same time, the bidirectional causality relationship implies that government interventions have an effective role on unemployment.

Finally, as expected, there is a bidirectional causality between investments and unemployment. This is because new investments bring more labor employment and thus constitute a reason for the change in unemployment. On the other hand, high unemployment rates may encourage new investments, especially through public interventions. Therefore, unemployment may also be a reason for investments. A graphical display of the JKS Test results is presented in Figure 1.

Figure 1: Graphical display of JKS test results



Source: Authors' own elaboration in line with the causality test findings

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5. Conclusions and Policy Implications

Unemployment is a serious problem that imposes significant costs not only individually but also socially and economically. Theoretically, economic growth, inflation, labor productivity, government expenditure and investments are associated with this problem. In addition to these, there is a perception in many countries that immigrants also cause unemployment, especially due to the recent increase in migration flows. However, there is neither theoretical nor empirical consensus on the impact of immigrants on unemployment.

In this study, the relationship between migration and unemployment is analyzed for 11 European countries through advanced panel data analysis techniques. The main reason for choosing European countries is that this region is one of the most preferred regions in terms of welfare level, working conditions, infrastructure facilities, democracy and legal structure. This study estimates the effect of migration on unemployment by applying the CS-DL technique, which is resistant to both cross-sectional dependence and slope heterogeneity and can also produce more reliable results for series that are stationary at different levels. Furthermore, causal relationships between variables are investigated using the JKS test, which accounts for Nickell bias and works well even in cases of heterogeneity. Thus, it differs from other studies conducted for EU countries not only in terms of the techniques used but also in terms of sample, period, and variable set.

The empirical findings suggest various policy implications to prevent unemployment from becoming an individual, social, and economic problem. Indeed, according to coefficient estimators, although migration has a negative effect on unemployment, this effect is statistically insignificant. In other words, our findings imply that the perception that migration increases unemployment is not valid. There may be several reasons for this. The first is that labor migrants are complements to native-born workers, not substitutes. Therefore, migrants fill the labor shortage. Some of the migrants support the creation of employment for both other migrants and native-born workers by making their own investments. In addition, the demand for young labor arising from the aging population may be met by migrants. In a sense, these findings also imply that the migration policy of Europe is rational. Therefore, migration policies must be designed in line with short- and long-term projections regarding labor demand.

The findings on inflation reveal that high rates of increase in the general price level pose a threat to employment. In this context, monetary and fiscal policies must be implemented in a coordinated manner. Economic growth is negatively correlated with unemployment, consistent with economic theory. This result points to the potential of economic growth

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to create employment. Thus, in order to sustain a strong and lasting economic growth performance, it is necessary to establish and expand the production and export of innovative and high value-added products. Furthermore, unnecessary and excessive public expenditures should be avoided.

References

Abdulloev, I., Gang, I., Landon-Lane, J. (2011). *Migration as a Substitute for Informal Activities: Evidence from Tajikistan*. Institute of Labor Economics. IZA Discussion Papers No. 6236.

Al-Kasasbeh, O. (2022). The relationship between unemployment and economic growth: is Okun's Law valid for the Jordan case. *International Journal of Economics Development Research (IJEDR)*, *3*(3), 217–226.

Aslan, A., Altinöz, B. (2020). The Relationship Between Unemployment and Immigration with Linear and Nonlinear Causality Tests: Evidence from the United States. *Economic Journal of Emerging Markets*, 12(1), 13–24.

Baghirov, A., Aliyeva, B., Sarkhanov, T. (2022). Investigation of Economic Factors Influencing GDP: An Empirical Study on European Countries. *International Journal of Economics and Management Systems*, 7, 415–432.

Baghirov, A., Sarkhanov, T. (2023). The Influence of Incoming Tourists and Consumer Price Index on Tourism Receipts. *African Journal of Hospitality, Tourism and Leisure*, 12(1), 16–30.

Baltagi, B. H., Feng, Q., Kao, C. (2012). A Lagrange Multiplier Test for Cross-Sectional Dependence in A Fixed Effects Panel Data Model. *Journal of Econometrics*, 170(1), 164–177.

Bekele, M., Sassi, M., Jemal, K., Ahmed, B. (2024). Human Capital Development and Economic Sustainability Linkage in Sub-Saharan African Countries: Novel Evidence from Augmented Mean Group Approach. *Heliyon*, 10(2), e24323.

Blomquist, J., Westerlund, J. (2013). Testing Slope Homogeneity in Large Panels with Serial Correlation. *Economics Letters*, 121(3), 374–378.

Boubtane, E. Coulibaly, D., Rault, C. (2013). Immigration, Growth, and Unemployment: Panel VAR Evidence from OECD Countries. *Labour*, 27(4), 399–420.

Boundi-Chraki, F. (2023). Do Technical Change and Mechanisation Negatively Affect Employment in The Manufacturing Sectors? An Empirical Assessment for The OECD Countries. *Economic Research-Ekonomska Istraživanja*, 36(2), 2172598.

Breusch, T. S., Pagan, A. R. (1980). The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics. *The Review of Economic Studies*, 47(1), 239–253.

Britto, D. G., Pinotti, P., Sampaio, B. (2022). The Effect of Job Loss and Unemployment Insurance on Crime in Brazil. *Econometrica*, 90(4), 1393–1423.

Final version of the article before editorial processing

Cebeci Mazlum, E. (2022). The Effect of Migration on Unemployment in G7 Countries: An Econometric Analysis. *The Journal of Academic Social Science*, 134(134), 340–351.

CFE (2014). *Migrant Entrepreneurs: Building Our Businesses Creating Our Jobs*. London: Center for Entrepreneurs.

Chakraborty, S. K., Mazzanti, M. (2021). Renewable Electricity and Economic Growth Relationship in The Long Run: Panel Data Econometric Evidence from The OECD. *Structural Change and Economic Dynamics*, 59, 330–341.

Chamunorwa, W., Mlambo, C. (2014). The Unemployment Impact of Immigration in South Africa. *Mediterranean Journal of Social Sciences*, 5(20), 2631–2631.

Chou, M. C. (2013). Does Tourism Development Promote Economic Growth in Transition Countries? A Panel Data Analysis. *Economic Modelling*, 33, 226232.

Chudik, A., Mohaddes, K., Pesaran, M. H., Raissi, M. (2016). Long-Run Effects in Large Heterogeneous Panel Data Models with Cross-Sectionally Correlated Errors. In: *Essays in Honor of Man Ullah*, pp. 85-135. Emerald Group Publishing Limited.

Dahmani, M., Mabrouki, M., Youssef, A. B. (2022). The Information and Communication Technologies-Economic Growth Nexus in Tunisia: A Cross-Section Dynamic Panel Approach. *Montenegrin Journal of Economics*, 18(2), 155–168.

Daştan, M., Yalçınkaya, Ö., Karabulut, K. (2020). Yapısal Reformların Ekonomik Büyüme Üzerindeki Etkileri: Geçiş Ekonomilerinden Kanıtlar. *Maliye Dergisi*, 179, 1–32.

DaVanzo, J. (1978). Does Unemployment Affect Migration? Evidence from Micro Data. *The Review of Economics and Statistics*, 60(4), 504–514.

Delgado-Prieto, L. (2022). *Immigration, Wages and Employment Under Informal Labor Markets*. Red Investigadores de Economia. Working Paper No. 96.

Ditzen, J. (2021). Estimating Long-Run Effects and The Exponent of Cross-Sectional Dependence: An Update to xtdcce2. *The Stata Journal*, 21(3), 687–707.

Doğaner, A. (2023). Türkiye'de Kamu Harcamaları ve İşsizlik Arasındaki İlişkilerin Fourier Eşbütünleşme Testi ile Analizi. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*, 14(40), 1142-1155.

Dritsaki, M., Dritsaki, C. (2024). Immigration, Growth and Unemployment: Panel VAR Evidence from EU Countries. *Journal of the Knowledge Economy*, 1–36.

Dustmann, C. Fabbri, F., Preston, I. (2005). The Impact of Immigration on the British Labour Market. *The Economic Journal*, 115(507), 324–341.

Esposito, P., Collignon, S., Scicchitano, S. (2020). The Effect of Immigration on Unemployment in Europe: Does the Core-Periphery Dualism Matter? *Economic Modelling*, 84, 249–258.

Fagereng, A., Onshuus, H., Torstensen, K. N. (2024). The Consumption Expenditure Response to Unemployment: Evidence from Norwegian Households. *Journal of Monetary Economics*, 146, 103578.

Fingleton, B., Olner, D., Pryce, G. (2020). Estimating the Local Employment Impacts of Immigration: A Dynamic Spatial Panel Model. *Urban Studies*, 57(13), 2646–2662.

Final version of the article before editorial processing

Fromentin, V. (2013). The Relationship Between Immigration and Unemployment: The Case of France. *Economic Analysis and Policy*, 43(1), 51–66.

Fuller-Thomson, E., Mehta, R., Sulman, J. (2013). Long-Term Parental Unemployment in Childhood and Subsequent Chronic Fatigue Syndrome. *International Scholarly Research Notices*, 2013(1), 978250.

Gündoğmuş, B., Bayır, M. (2021). The Effect of International Migration on Unemployment: An Empirical Analysis on The European Countries. *Manas Sosyal Araştırmalar Dergisi*, 10(4), 2204–2217.

Gyamfi, B. A., Agozie, D. Q., Bekun, F. V. (2022). Can Technological Innovation, Foreign Direct Investment and Natural Resources Ease Some Burden for The BRICS Economies Within Current Industrial Era?. *Technology in Society*, 70, 102037.

Hamrita, M. E., Mekdam, M. (2016). *Energy Consumption, CO2 Emissions and Economic Growth Nexus: Evidence from Panel Granger Causality Test*. Munich Personal RePEc Archive Paper No. 72908.

Harris, N. (2003). *Economic Migration and the European Labour Market*. The European Policy Centre, EPC Issue Paper 2(I).

ILO (2021). *ILO Global Estimates on Migrant Workers: Results and Methodology*. Geneva: International Labour Office.

Jahoda, R., Godarová, J. (2016). Unemployment and its Cost to Public Budgets in the Czech Republic in 2010-2015 1. *Ekonomický Časopis*, 64(7), 629–645.

Jalil, A. (2014). Energy–Growth Conundrum in Energy Exporting and Importing Countries: Evidence from Heterogeneous Panel Methods Robust to Cross-Sectional Dependence. *Energy Economics*, 44, 314–324.

Juodis, A., Karavias, Y., Sarafidis, V. (2021). A Homogeneous Approach to Testing for Granger Non-Causality in Heterogeneous Panels. *Empirical Economics*, 60(1), 93–112.

Kalleberg, A. L., Von Wachter, T. M. (2017). The US Labor Market During and After The Great Recession: Continuities and Transformations. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, 3(3), 1–19.

Kerr, S. P., Kerr, W. R. (2016). *Immigrant Entrepreneurship*. Harvard Business School. Working Paper No. 17–011.

Khalid, K., Hussain, B., Ali, S. (2021). Evaluating Eco-efficiency in Consumption and Production Through Sustainable Utilization of Resources: A Panel Analysis of APAC by Population. *Renewable Energy*, 170, 1096–1106.

Linn, M. W., Sandifer, R., Stein, S. (1985). Effects of Unemployment on Mental and Physical Health. *American Journal of Public Health*, 75(5), 502–506.

Lofstrom, M., Wang, C. (2019). *Immigrants and Entrepreneurship*. IZA World of Labor. No. 2019: 85v2.

Masoud, N. (2025). Artificial intelligence and unemployment dynamics: an econometric analysis in high-income economies. *Technological Sustainability*, 4(1), 30-50.

Final version of the article before editorial processing

Migration Data Portal (2024). *Migration and Human Mobility: Key Global Figures*. [Retrieved 2024-12-08] Available at: https://www.migrationdataportal.org/key-figures

Milner, A., Page, A., LaMontagne, A. D. (2013). Long-Term Unemployment and Suicide: A Systematic Review and Meta-Analysis. *PLOS One*, 8(1), e51333.

Nathan, M. (2014). The Wider Economic Impacts of High-Skilled Migrants: A Survey of the Literature for Receiving Countries. *IZA Journal of Migration*, 3(1), 1–20.

OECD (2010). *Entrepreneurship and Migrants (Report by the OECD Working Party on SMEs and Entrepreneurship)*. Paris: Organization for Economic Cooperation and Development.

Oyadeyi, O. O., Ibukun, C. O., Arogundade, S., Oyadeyi, O. A., Biyase, M. (2024). Unveiling Economic Resilience: Exploring The Impact of Financial Vulnerabilities on Economic Volatility through The Economic Vulnerability Index. *Discover Sustainability*, 5(1), 253.

Pappas, A., & Boukas, N. (2025). Examining Impact of Inflation and Inflation Volatility on Economic Growth: Evidence from European Union Economies. *Economies*, 13(2), 31.

Pesaran, M. H. (2004). *General Diagnostic Tests for Cross Section Dependence in Panels*. The Institute for the Study of Labor Discussion Paper No. 1240.

Pesaran, M. H. (2007). A Simple Panel Unit Root Test in The Presence of Cross-Section Dependence. *Journal of Applied Econometrics*, 22(2), 265–312.

Pesaran, M. H., Ullah, A., Yamagata, T. (2008). A Bias-Adjusted LM Test of Error Cross-Section Independence. *The Econometrics Journal*, 11(1), 105–127.

Pesaran, M. H., Yamagata, T. (2008). Testing Slope Homogeneity in Large Panels. *Journal of Econometrics*, 142(1), 50–93.

Pohlan, L. (2019). Unemployment and Social Exclusion. *Journal of Economic Behavior & Organization*, 164, 273–299.

Ruhs, M., Vargas-Silva, C. (2014). *The Labour Market Effects of Immigration*. Migration Observatory Briefing, COMPAS, University of Oxford.

Sanchez Rico, M., Plessz, M., Airagnes, G., Ribet, C., Hoertel, N., Goldberg, M., Zins M., Meneton, P. (2023). Cardiovascular Burden and Unemployment: A Retrospective Study in A Large Population-Based French Cohort. *PLOS One*, 18(7), e0288747.

Sarafidis, V., Yamagata, T., Robertson, D. (2009). A Test of Cross Section Dependence for A Linear Dynamic Panel Model with Regressors. *Journal of Econometrics*, 148(2), 149–161.

Saunders, P. (2002). The Direct and Indirect Effects of Unemployment on Poverty and Inequality. *Australian Journal of Labour Economics*, 5(4), 507–529.

Sengupta, S., Mihalache, R. P. (2021). How Do Immigration Impact Unemployment and Economic Prosperity? An Extensive Investigation from The OECD Nations. *Theoretical & Applied Economics*, 28(1), 5–22.

Simionescu, M., Schneider, N. (2022). Revisiting the nuclear energy-income nexus in Europe: An application of the JKS panel causality test with cross-sectional dependence and heterogeneity. International Journal of Energy Research, 46(6), 8328–8351.

Škuflić, L., Vučković, V. (2018). The Effect of Emigration on Unemployment Rates: The Case of EU Emigrant Countries. *Economic Research-Ekonomska Istraživanja*, 31(1), 1826–1836.

Final version of the article before editorial processing

Sohail, A., Du, J., Abbasi, B. N. (2023). Exploring The Interrelationship Among Health Status, CO2 Emissions, and Energy Use in The Top 20 Highest Emitting Economies: Based on The CS-DL and CS-ARDL Approaches. *Air Quality, Atmosphere & Health*, 16(7), 1419–1442.

Swamy, P. A. (1970). Efficient Inference in a Random Coefficient Regression Model. *Econometrica: Journal of the Econometric Society*, 38(2), 311–323.

Tapia Granados, J. A., Christine, P. J., Ionides, E. L., Carnethon, M. R., Diez Roux, A. V., Kiefe, C. I., Schreiner, P. J. (2018). Cardiovascular Risk Factors, Depression, and Alcohol Consumption During Joblessness and During Recessions Among Young Adults in CARDIA. *American Journal of Epidemiology*, 187(11), 2339–2345.

Viseth, A. (2020). *Immigration and Employment: Substitute Versus Complementary Labor in Selected African Countries*. International Monetary Fund Working Papers No. 2020/149.

Voumik, L. C., Sultana, R., Dey, R. (2023). Going Away or Getting Green in BRICS: Investigating the EKC Hypothesis with Human Capital Index, Nuclear Energy, Urbanization, and Service Sectors on The Environment. *World Development Sustainability*, 2, 100060.

Wang, W., Hu, R., Zhang, C., Shen, Y. (2023). Impact of Common Institutional Ownership on Enterprise Digital Transformation—Collaborative Governance or Collusion Fraud? *Heliyon*, 9(11), e21641.

Wei, Z., Lihua, H. (2023). Effects of Tourism and Eco-Innovation on Environmental Quality in Selected ASEAN Countries. *Environmental Science and Pollution Research*, 30(15), 42889–42903.

Westerlund, J. (2007). Testing for Error Correction in Panel Data. *Oxford Bulletin of Economics and Statistics*, 69(6), 709–748.

Wilson, S. H., Walker, G. M. (1993). Unemployment and Health. *A Review. Public Health*, 107(3), 153–162.

Wolla, S. A. (2014, May): The Economics of Immigration: A Story of Substitutes and Complements. *Page One Economics Newsletter*, 1–5.

Xiao, J., Karavias, Y., Juodis, A., Sarafidis, V., Ditzen, J. (2023). Improved Tests for Granger Noncausality in Panel Data. *The Stata Journal*, 23(1), 230–242.

Xie, P., Jamaani, F. (2022). Does Green Innovation, Energy Productivity and Environmental Taxes Limit Carbon Emissions in Developed Economies: Implications for Sustainable Development, *Structural Change and Economic Dynamics*, 63, 66–78.

Yilmaz, E., Günel, T. (2022). Revisiting Immigration-Unemployment Relationship in Europe. *Politická ekonomie*, *70*(6), 711–729.

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