“Interconnections in the education–migration–labor market chain in Central and Eastern Europe”

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INTERCONNECTIONS IN THE EDUCATION–MIGRATION–LABOR MARKET CHAIN IN CENTRAL AND EASTERN EUROPE

Abstract

This study examines the interconnections between transformations in the education sphere, migrations waves, and labor market in 2000–2021 based on a panel data set for 14 Central and Eastern European countries (7 – former members of the Council for Mutual Economic Assistance; 5 – former republics of the USSR, and 2 – former republics of Yugoslavia). Statistical data were collected from the World Bank, the Organisation for Economic Cooperation and Development, and the International Labour Organization databases. To describe this interconnection, a pool of parameters was formed. Those that cause the greatest variability were selected using exploratory factor analysis: for education – the number of teachers and students in higher education and public spending on education; for migration – the net migration flow, personal remittances sent and received; for labor market – unemployment rate and the share of highly educated people among the employed. Confirmatory factor analysis identified the most influential determinants: for education – the number of students in higher education; for migration – paid personal remittances; for labor market – unemployment rate. The covariance analysis demonstrated a robust direct correlation between education and migration (positive shifts in the education sector serve as a catalyst for pursuing superior employment opportunities or continuing education abroad). A relatively weak direct correlation was between education and the labor market (a more highly educated workforce has only a limited impact on the structure and dynamics of the labor market). Finally, a moderate inverse correlation was between migration and the labor market (deteriorating labor market conditions give rise to migration waves).

Keywords education, migration, employment, workforce, mobility, human capital, labor market, confirmation factor analysis, exploratory factor analysis

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INTRODUCTION

The interconnections in the education–migration–labor market chain have a strong impact on shaping the global economy and the socio-economic development of countries at both national and international levels. However, recent global challenges, such as the COVID-19 pandemic and geopolitical conflicts, especially Russia's full-scale military invasion of Ukraine, have caused major disruptions in this chain, leading to significant socio-economic challenges.

The COVID-19 pandemic has significantly transformed the education sector, compelling educational institutions across all continents to adopt remote learning methods. This shift not only highlighted existing inequalities in access to educational technologies and the internet but also underscored the critical need for digital literacy among both students and educators. Data indicates a decline in academic mobility among EU students: in 2020, 11.2% of graduates completing bachelor's and master's degrees had experience studying abroad, while this fig-

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ure dropped to 9.8% in 2021 (OECD, 2023). These changes have led to consequences in various aspects of the educational process, including impacting students' academic mobility. At the same time, global conflicts further exacerbate the challenges faced by students and educational institutions.

The closure of borders, travel restrictions due to the pandemic, and economic uncertainty have resulted in socio-economic transformations, including job losses among migrants and various reasons for their inability to return to their families in their home countries. People migrate for better educational opportunities and jobs, while at the same time, labor market conditions and access to education influence migration decisions.

Significant socio-economic changes have occurred within the labor market. According to the Organisation for Economic Cooperation and Development (OECD, 2023), the unemployment rate rose by 5.3% in 2023, increasing the number of unemployed to 191 million people compared to the previous year. At the same time, the International Labour Organization (ILO) reported a significant rise in informal employment in 2022, with the number of unofficially employed individuals increasing by 58% to approximately 2 billion people (ILO, 2023). Rapid technological advancements, automation, and economic globalization are reshaping labor markets. Governments need to adapt policies to ensure that education systems produce skilled workers who can thrive in these changing environments, reducing unemployment and managing migration flows.

Current studies on the interconnections in the education–migration–labor market chain focus on specific national or regional contexts, limiting insights into their global interactions. Expanding research to a global perspective addresses this gap and offers a more nuanced understanding of these interactions. Furthermore, it is crucial to comprehend the chain reactions and mutual influences within the education–migration–labor market chain while implementing state policy measures. The application of regulatory interventions in separate components of this chain may lead to a failure to consider the transmission of impulses and convergent interdependencies between them. In the context of global socio-economic transformations and the rapid diffusion of regulatory effects between different types of economic activity, it is crucial that public policy adopt a systemic approach rather than focusing on isolated interventions.

1. LITERATURE REVIEW

The study of the interconnections in the education–migration–labor market chain has gained significant academic interest due to globalization (Mańka-Szulik et al., 2024), technological changes (Vasylieva & Kasyanenko, 2013; Kuzior et al., 2022b) and demographic shifts (Lyeonov et al., 2021). Contemporary challenges, such as developing policies for migrant integration, adapting educational programs to labor market needs, and managing migration flows to stimulate economic growth, require a comprehensive approach to analyzing these interactions.

Educational trends reveal the impact of various factors on the quality of the educational process. These factors range from local issues, such as the effectiveness of teachers, the quality of curricula, and textbooks (Samiya & Asma, 2024), to broader concerns, including the equitable distribution of financial resources among regions, additional support for less economically developed areas, and the promotion of social investment in higher education. More global issues include educational disruption and learning loss (Artyukhov et al., 2024a) caused by conflicts and crises, such as COVID-19 and the full-scale war in Ukraine. Strategies for resilience and recovery include adapting national digitalization approaches (Artyukhov et al., 2024b) and fostering innovation through R&D expenditure as a percentage of GDP (Dobrovolska et al., 2023). These trends highlight the need to reassess education as a crucial component in state governance to emphasize the importance of skill development, inclusive educational policies, and high-quality education.

In the field of migration management, several measures are being developed. These include support for young professionals to overcome internal over-competition (Chen et al., 2024) and improve population well-being through enhanced financial literacy (Didenko et al., 2023). Additionally, efforts on migration patterns are being made to formalize the impact of environmental factors, such as storms and floods (Didenko et al., 2021). The military conflicts, particularly the war in Ukraine, have caused large-scale population displacement, with over 6 million refugees from Ukraine recorded as of 2024 (The World Bank, 2023b). and significant labor market imbalances (Lavreniuk et al., 2023; Tepliuk et al., 2024).

Modern transformations in the labor market involve establishing criteria for attracting and retaining talented employees, such as promoting growth in the workplace, embracing flexibility and diversity in work arrangements (hybrid, onsite, remote), and integrating nature with work to focus on human needs. For example, there have been changes in income tax approaches based on family income in Ukraine (Zolkover et al., 2022; Tiutiunyk et al., 2022b) and the development of the IT sector, e-commerce, and remote work industries during the pandemic. These changes have driven the advancement of artificial intelligence and its integration into open innovation processes and business model innovation. However, sectors such as tourism, hospitality, and retail have seen increased informal employment and business activities. Additionally, data on the income ratio between the top 10% and the bottom 10% of earners show integration lags of 1 year (Romania, Hungary, Croatia), 2 years (Ukraine, Slovenia, Estonia), and 3 years (Poland, Slovakia), highlighting the impact of inequality on informal income schemes (Tiutiunyk et al., 2022a). This indicates an expansion of the labor market segment beyond the traditional economy, which may have both short-term and long-term socio-economic consequences. Managers need to provide fair work schedules, equitable workloads among employees, and respectful, professional treatment (Rajan, 2023). Ensuring a healthy work environment and safe working methods is also crucial, including providing additional training for young workers in part-time positions (Mujtaba & Kaifi, 2023).

Moving on to the interactions within the chain that generate global socio-economic changes, a significant portion of the research focuses on analyzing the relationships between migration and the labor market. Olah et al. (2017) investigated the impact of international migration on the labor market using Hungarian universities as a case study. They found a weak link between migration and the economy, though social aspects were significant. Kazemi et al. (2018) argued that the Iranian labor market suffers from a "brain drain" due to educational migration. The study revealed that lower tuition fees in Malaysian universities and access to advanced technologies encouraged graduates to remain in Malaysia after graduation.

Conversely, a positive correlation between migration and the labor market was found through research on the effects of spatial mobility on early career labor market outcomes for various educational programs and qualification levels (Mitze & Javakhishvili-Larsen, 2020). However, the analysis often examines the impact of migration and the labor market in a one-way direction. Some studies show a lack of connection between higher education and migration, yet a clear link exists between the labor market and migration. For example, many skilled and unskilled workers from the Middle East and North Africa are willing to emigrate in search of work due to underdeveloped domestic labor markets (Ramos, 2019). Social aspects, such as the potential social risks for labor migrants, including the lack of intercultural competence, communication skills, and initiative, are highlighted by studies on Ukrainian migrants in Western Europe (Kuzior et al., 2020). Additionally, medical staff turnover in China has been attributed to workplace issues such as high workloads, inadequate salary for the work performed, limited career advancement opportunities, professional burnout, and poor working conditions (Neri, 2024).

Another significant area of research focuses on the relationship between education and migration. On the one hand, international student status creates additional financial constraints for living expenses and tuition fees at British universities (Murray & Gray, 2023). Ukrainian researchers face similar challenges, leading to initiatives such as the development of programs to attract Ukrainian scientists

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abroad to promote scientific diplomacy (Polishchuk et al., 2023). On the other hand, adult education in German institutions serves as a tool to combat reverse migration among residents. By enhancing factors such as professional staff, sectoral support, and financial resources, Germany was able to attract more migrants to specialized courses, which accelerates their adaptation and increases the likelihood of them staying (Käpplinger, 2020).

Research on the relationship between higher education and the labor market typically explores how labor market trends impact higher education, given the need to reassess the goals of the higher education sector. Specifically, the importance of alignment between education and professional careers is highlighted (Quintini, 2011), as the knowledge acquired in higher education institutions may not always align with the skills demanded by the labor market (Lohberger & Braun, 2022). Consequently, approaches to evaluating professional education are actively being developed to ensure a skilled workforce that meets the needs of companies and contractors (Aid et al., 2024) using cross-sectional data on education and the labor market (Habets et al., 2020). This can be achieved by establishing strategic guidelines for the development of human capital intellectualization (Kuzior et al., 2022a) and engaging industrial universities in collaboration to enhance the labor market from a sustainable development perspective. Additionally, support for local skills is emphasized, including the need for upskilling all workers, i.e., semi-skilled and unskilled labor (Djamal et al., 2023). A positive connection has been identified between students' perceptions of 21st-century skills and their own views on the "relevance of education to the future labor market." Practical suggestions include developing investment laboratories at universities to enhance practical skills for future employment (Kaya et al., 2023). Other perspectives suggest a focus on business development collaboration (Samoilikova et al., 2023) and fostering individual entrepreneurial orientation and intentions among university students (Kaouache et al., 2024) through distance business education (Ogunleye et al., 2023).

When examining research dedicated to the triad of education, migration, and the labor market from the perspective of socio-economic transformations, it is evident that studies often focus on specific countries and explore the direct impact of one component on others. For instance, Han and Li (2017) identified the impact of internal migration in China on both the labor market and education, where internal migration has exacerbated wage disparities and provided additional benefits for the development of the education sector. Conversely, the existence of connections and associated socio-economic processes within these components of the chain is not consistently demonstrated across different countries. For example, in the Czech Republic, no interconnected socio-economic processes between education and the labor market have been identified, highlighting a disconnect between education and the professions of migrant workers (Valenta & Drbohlav, 2018).

Thus, this study aims to determine the interconnections within the education–migration–labor market chain, identify the key determinants influencing each link in the chain, and understand the factors that contribute to their greatest variability.

2. METHODOLOGY

The analysis includes countries that have shared historical and socio-economic context (Table 1). In 1990, these countries had the same starting conditions and were members of the Council for Mutual Economic Assistance or the Republics of the former USSR or Yugoslavia. These countries share a history of transitioning from centrally planned economies to market-oriented systems after the collapse of communism. This transition has led to similar challenges in education reform, labor market restructuring, and migration patterns.

Several countries in the sample are now members of the European Union (Poland, the Czech Republic, Slovakia, Hungary, etc.), while others are in the process of integration (Western Balkan states, Ukraine, Moldova). The EU plays a significant role in shaping labor and migration policies in these countries, creating shared challenges and opportunities, especially regarding free movement of labor and educational alignment with European standards (Bologna Process), etc.

This study is conducted on panel data from a sample of countries rather than on individual country

Table 1. Set of the countries in the study's sample

Classification sign	Members of the EU	Candidate countries for joining the EU
Former members of the Council for Mutual Economic Assistance	Poland, the Czech Republic, Slovakia, Hungary, Bulgaria, Romania	Albania
Former republics of the USSR	Lithuania, Latvia, Estonia	Ukraine, Moldova
Former republics of Yugoslavia	Slovenia, Croatia	

Note: Bosnia and Herzegovina, North Macedonia, Serbia, and Montenegro (as former republics of Yugoslavia) were not included in the survey sample due to a lack of data. Despite not being formally classified as Central and Eastern European countries, Ukraine and Moldova were included in the sample due to their European geopolitical status and their decision to join the European Union.

data for the following reasons. Since panel data include observations of different subjects at various points in time, this increases the volume of information, enhances the statistical power of models, and makes estimates more reliable. Second, using panel data can lower the level of multicollinearity between variables, improving the accuracy of parameter estimates in models. Next, panel data allow for consideration of individual differences between subjects (e.g., countries, companies, or people). This helps to avoid bias that may occur if individual effects are not accounted for. Fourth, panel data allow for the study of differences between subjects and changes within subjects over time. This helps in examining the dynamics of change and identifying causal relationships. Finally, panel data enable the evaluation of the impact of events or policies that change over time and tracking their consequences.

The selected sample includes 14 indicators that characterize each component of the education–migration–labor market chain. In order to achieve a generalized understanding of the prevailing trends of interdependencies in European countries, the modeling was conducted on panel data representing all countries rather than on data collected for each country individually.

An examination of the data calculation processes reveals that the educational data on the number of students and teachers come from national statistics and are collected by UNESCO's Institute for Statistics (UIS) (UNESCO, 2023). To give an overview of higher education, the average years of study are calculated based on how long students typically spend in university. Next, public expenditure on education shows how much of the Gross Domestic Product (GDP) is spent on education. This includes money from both national and international sources, including transfers from international organizations to the government. Moving on to migration data, the net flow of internationally mobile students measures the difference between students coming into a country to study and those leaving to study abroad. To understand financial impacts, remittances represent the money received from abroad minus the money sent abroad by residents. For labor market data, the employment rate is the percentage of people employed out of the total working-age population. On the other hand, the unemployment rate is the percentage of unemployed individuals within the total labor force. Another critical measure is the GDP per employed person, which shows labor productivity by dividing the total GDP by the number of employed individuals. Lastly, the age dependency ratio compares the number of people not in the working age (under 15 or over 65) to those who are working age (15 to 64 years old) (The World Bank, 2024a, c-f). The set of indicators is demonstrated in Table 2.

This study suggests employing methods of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). These approaches enable the identification of the most relevant variables and the determination of the degree of their interdependence. To address nonlinearity and ensure uniformity, the input variables were logarithmized. Specifically, in the first stage, EFA was utilized to group the collected data according to principal factors to identify the underlying factors that can explain the maximum variability of the observed variables (Taherdoost et al., 2022). The degree of association and correlation of individual variables with the factor was determined using factor loadings, specifically focusing on values greater than 0.4 (Brown, 2015). Additionally, orthogonal rotation of factors was conducted using the varimax method to enhance the interpretability of the results (Pavlov et al., 2021; Guadagnoli

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Table 2. The data for analyzing socio-economic transformations in the education–migration–labor market chain

Chain component	Indicators	Measurement Unit	Symbol
Education	Number of students enrolment in tertiary education	thousand persons	stud
	Government expenditure on education	PPP billion USD	govexp
	School life expectancy in tertiary education	years	life
	Number of teachers in tertiary education	thousand persons	teach
Migration	Net flow of internationally mobile students (inbound – outbound)	thousand persons	mig
	Personal remittances, received	million USD	rem1
	Personal remittances, paid	million USD	rem2
	Refugee population by country of origin	thousand persons	ref
Labor Market	Ratio of the labor force with advanced education and population with advanced education	% of total working-age (15-64 years)	labeduc
	Unemployment rate	thousand persons	unemp
	Labor force	thousand persons	lab
	GDP per labor person	billion USD	gdp
	Coefficient of working age ratio	%	workage
	Number of employed population	thousand persons	emp

& Velicer, 1988). In this study, the most relevant variables were identified as those included in the first factor, which demonstrated a substantial cumulative variance.

In the next step, the selected variables were used to conduct confirmatory factor analysis (CFA), which involves examining the patterns of relationships between latent and observed variables (Abrahim et al., 2019; Brown, 2015; Costa & Sarmento, 2019). At this stage, the variation and covariance relationships were analyzed, allowing for the assessment of the strength and direction of the influence of unmeasured (latent) factors on the observed variables.

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are suitable methods for analyzing based on the following reasons (Brown, 2015; Wegener & Fabrigar, 2011).

First, EFA is useful for identifying latent variables, or hidden factors, that may not be directly observable but are influencing the interrelationships between education, migration, and labor market outcomes. EFA can help identify factors that connect three areas. It helps uncover the patterns of correlations among variables, which can give insight into how different aspects of education, migration, and labor markets interact across different countries. Brown (2015) explained its applicability to testing hypotheses and validating latent constructs across different groups, including cross-country studies. It also covers measurement invariance, which is crucial for comparing results across different countries.

Second, once the structure of the latent variables is hypothesized (based on theory or the results from EFA), CFA allows one to test whether the data fit this theoretical model. This analysis suggests specific hypotheses about how education influences migration or how labor market conditions affect migration patterns. CFA can confirm whether these hypothesized relationships hold up when tested against real-world data. CFA is especially powerful in confirming pre-existing relationships or structures between education, migration, and labor market outcomes, helping to verify whether the factors identified in EFA or through theoretical frameworks align with the observed data.

Third, EFA is ideal for this kind of context, as it can help to uncover common latent factors that may drive similar patterns across a sample of countries despite their heterogeneity. EFA will allow the analysis to explore whether there are shared underlying dimensions (e.g., economic opportunity or educational quality) that are common across all or some of the countries.

Fourth, CFA can be used to test whether the factor structures hold across different countries. CFA ensures that the relationships and structures dis-

covered in the data are valid not only within individual countries but across the whole sample, confirming the robustness of the findings across various socio-economic conditions.

The analysis was conducted over the period from 2000 to 2021, maintaining chronological consistency with a one-year interval. To construct the panel data model, available statistics were collected from the databases of the World Bank, the Organisation for Economic Cooperation and Development (OECD), UNESCO (UIS), and the International Labour Organization (ILO). The software STATA 18/SE is used to implement all stages of this research, which provides a comprehensive suite of tools for statistical analysis, data management, and graphical representation of results.

3. RESULTS

Table 3 presents the results of the exploratory factor analysis (EFA) after rotation, aimed at selecting the most relevant indicators for each component of the education–migration–labor market chain.

The education component includes indicators that characterize the number of students in higher education institutions, government expenditures on higher education, and the number of instructors in higher education programs. Simultaneously, the labor market component is determined by the number of individuals with higher education among the working-age population, and the unemployment rate. In the case of the migration component, the importance of net migration flow, as well as received and sent personal remittances, was identified. The dispersion of these data indicates that the indicators can be structured or forecasted, thus making them suitable for defining the components of the chain.

In the second stage of the analysis, a schematic model specification for conducting confirmatory factor analysis (CFA) was developed (Figure 1). In this specification, *lstud, lgovexp, lteach, lmig, lrem1, lrem2, llabeduc,* and *lunempl* are manifest/endogenous variables, while education, migration, and labor market are latent/exogenous variables.

Initially, the structure of the triad of components in this chain was assessed by identifying the most influential indicators for each latent variable individually, with the variables presented as standardized coefficients (Table 4). This approach allows for the comparison of the impact of different variables on the model's outcomes, regardless of the scale of the input data.

As a result, it was found that within the education component, all three indicators demonstrate a high degree of impact, with the highest indicator being the number of students in higher education (*lstud*). In the migration component, the most influential indicator is paid personal remittances (*lrem2*). As for the labor market component, the most significant indicator is the unemployment rate (*lunemp*).

Table 5 presents the coefficients of variation (sample variances) for the model's indicators. For example, the variation in the proportion of individuals with higher education among the employed population (*e.llabeduc*) is approximately 86% of its mean value. The variation in remittances received by migrants is 53.2%, while the variation in paid remittances from migrants corresponds to 35.7%.

Table 3. The selection of the most relevant indicators for each component of the education–migration–labor market chain using exploratory factor analysis (EFA)

Education		Labor market		Migration	
Indicator	**Factor Loading**	**Indicator**	**Factor Loading**	**Indicator**	**Factor Loading**
lstud	0.987	llabeduc	0.678	lmig	0.601
lgovexp	0.824	lunemp	0.591	lrem1	0.762
llife	0.213	llab	–0.109	lrem2	0.742
lteach	0.916	lgdp	0.112	lref	–0.031
–	–	lworkage	0.096	–	–
–	–	lemp	0.019	–	–
Eigenvalues	2.311	2.021		1.253	
Cumulative Variance	0.980	0.815		1.104	

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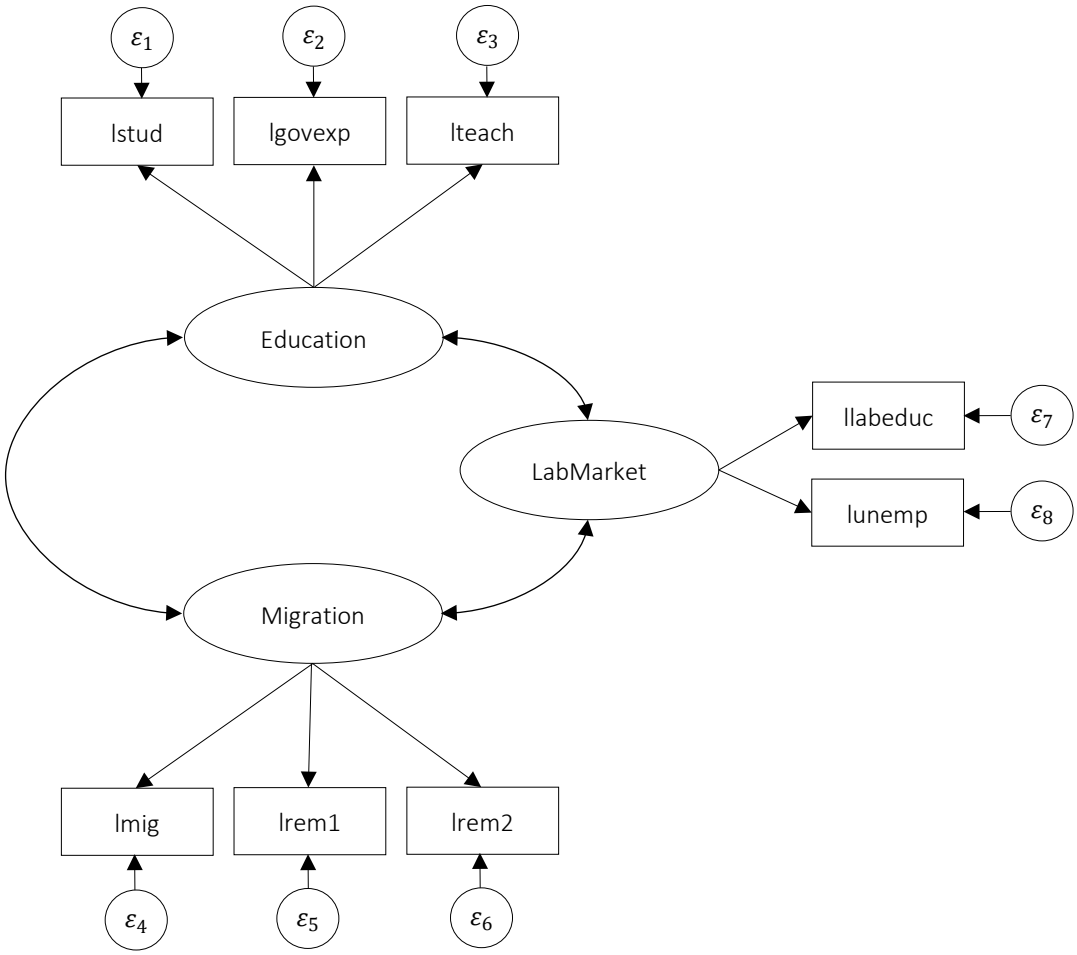

Figure 1. Schematic delineation of the model for analyzing the interconnections in the education–migration–labor market chain

Table 4. Characteristics the interconnections in the education–migration–labor market chain

Latent Variable (*Y*)	Observed Variables (*X*)	Path Coefficient (λ)	Standard Error Coefficient	z	P>|z|
Education	lstud	0.977	0.010	100.740	0.000
	lgovexp	0.874	0.030	29.530	0.000
	lteach	0.974	0.010	97.490	0.000
Migration	lmig	0.765	0.066	11.590	0.000
	lrem1	0.684	0.075	9.070	0.000
	lrem2	0.802	0.057	14.190	0.000
LabMarket	llabeduc	0.374	0.136	2.750	0.003
	lunemp	0.547	0.156	3.500	0.000

The major variation among the latent indicators is observed in the education component, indicating a significant influence of this sector on the chain. The standard errors demonstrate the high accuracy of these variation results ($e < 0.1$), except for the variation in the unemployment variable *(e.lunemp)*.

The results of the covariance analysis of the interconnections in the education–migration–labor market chain are presented in Table 6. These findings reveal a strong direct relationship between education and migration, a weak direct relationship between education and the labor market, and a moderate inverse relationship between migration and the labor market. This means that as the education sector improves (e.g., more students and better educational funding), there is a corresponding increase in migration flows. Better

Table 5. Variation in the interconnections in the education–migration–labor market chain

Variance Value	Path Coefficient (λ)	Standard error	[95% Confidence Interval]	
var(e.lstud)	0.045	0.019	0.019	0.103
var(e.lgovexp)	0.236	0.052	0.154	0.363
var(e.lteach)	0.051	0.019	0.024	0.108
var(e.lmig)	0.415	0.101	0.258	0.669
var(e.lrem1)	0.532	0.103	0.364	0.778
var(e.lrem2)	0.357	0.091	0.217	0.587
var(e.llabeduc)	0.860	0.102	0.681	1.085
var(e.lunemp)	0.701	0.171	0.435	1.131

Table 6. Covariance of the interconnections in the education–migration–labor market chain

Covariance	Path Coefficient (λ)	Standard Error Coefficient	z	P>|z|	[95% conf. interval]	
cov(Education, Migration)	0.758	0.076	9.930	0.000	0.608	0.908
cov(Education, LabMarket)	0.231	0.243	0.950	0.016	–0.071	0.246
cov(Migration, LabMarket)	–0.432	0.297	–3.610	0.005	–1.655	–0.49

education often leads to more people seeking opportunities abroad, either for further education (international students) or for better job prospects. This phenomenon is commonly seen when people move to countries offering advanced educational programs or more favorable employment conditions for highly educated individuals. A weak direct relationship between education and the labor market suggests that improvements in education only have a small or limited impact on labor market outcomes. While better education can lead to a more skilled workforce, the effects on the broader labor market (e.g., unemployment rates) are not as pronounced. A weak relationship indicates that other factors, such as economic conditions, industry demand, and labor market policies, may significantly shape labor market outcomes than education alone. A moderate inverse relationship between migration and the labor market means that as labor market conditions worsen (e.g., higher unemployment), migration tends to increase. This is a common pattern, as people often leave their home country in search of better employment opportunities when the local labor market is not favorable. Conversely, if labor market conditions improve, migration flows might decrease as people find more opportunities domestically.

Figure 2 presents the final graphical and computational result of the path diagram for determining socio-economic transformations through the structural and functional interdependencies in the education–migration–labor market chain.

The model is statistically significant and adequate, with all criteria meeting the critical values. The coefficient of determination ($R^2 = 0.996$) indicates a high capacity of the selected latent factors to explain the variation in the observed indicators. The RMSEA value of 0.061 falls within the acceptable range, suggesting a satisfactory fit of the model to the data.

Table 7 presents the results of measuring the degree of linear relationship between the structural components of the chain using path coefficients, which account for the interpretive aspects of socio-economic transformations between latent variables, including their strength and direction.

The positive changes in the higher education sector, which may be associated with the number of students and instructors in higher education institutions, as well as their funding, lead to an increase in migration flows among the population. The significant impact of migration on higher education has been examined in terms of both human and financial resources. These educational improvements act as drivers for migration, particularly international migration because people tend to move to places where they can benefit from better education or leverage their educational achievements for career opportunities. More students seek to study abroad as educational institutions expand and improve, particularly with international collaborations and higher-quality programs. Countries with well-funded and prestigious uni-

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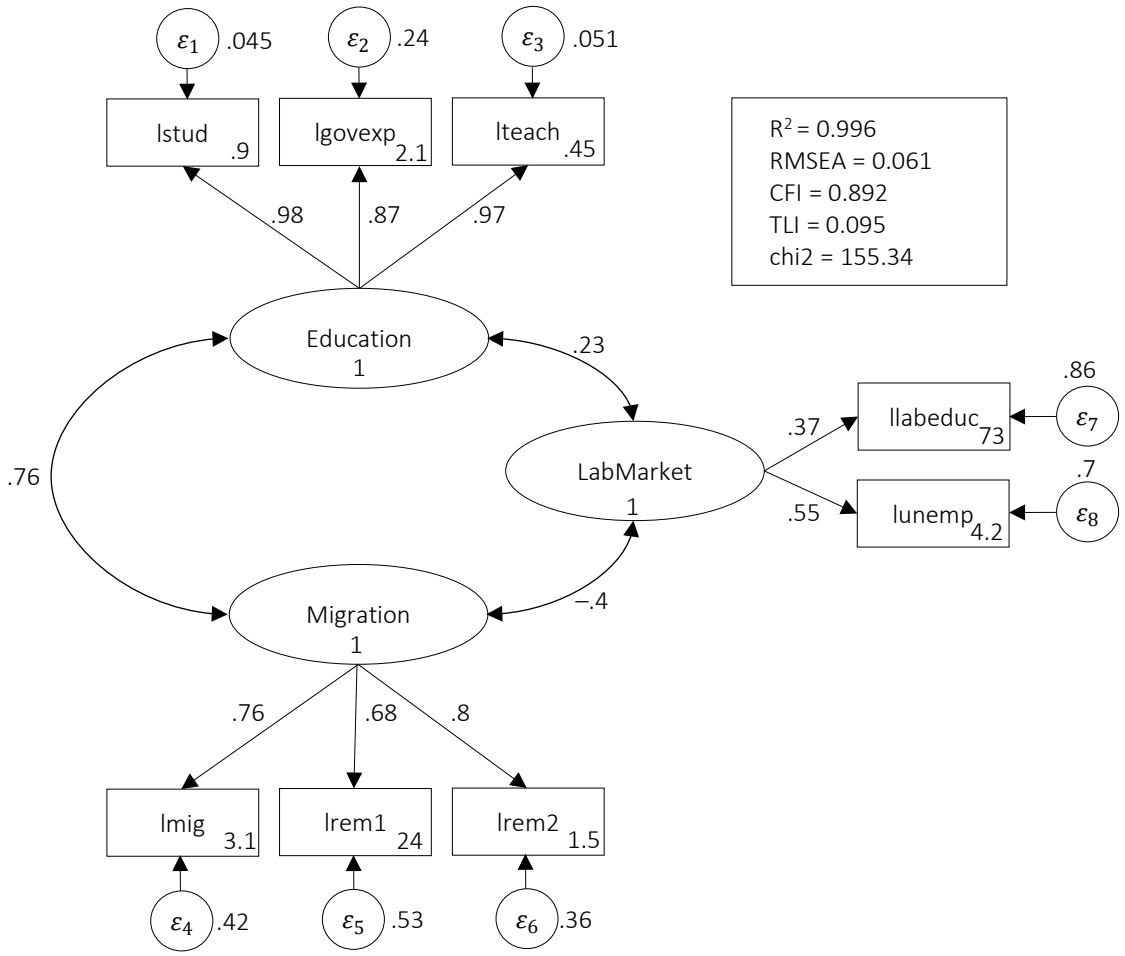

Figure 2. Effective model specification for determining the interconnections in the education–migration–labor market chain

Table 7. The interconnections in the education–migration–labor market chain

Coefficient	Path Coefficient (λ)	Standard Error Coefficient	z	P>|z|
Education → Migration	0.845	0.138	5.500	0.000
Education → LabMarket	0.044	0.013	1.328	0.001
LabMarket → Migration	−0.361	0.967	−3.430	0.000

versities attract international students. Moreover, domestic students may also move abroad for better education, contributing to migration flows. As people acquire higher levels of education, they tend to seek better employment opportunities, often in countries with more developed economies or sectors that value their skills. This is especially true in fields like technology, medicine, and engineering, where highly educated individuals are in demand globally. The development of universities and higher education institutions can attract international faculty and researchers, further driving migration. These individuals contribute not only by teaching but also by engaging in research that may involve cross-border collaborations and networks, further facilitating migration.

Notably, the analysis reveals that an increase in the latent construct education by one unit corresponds to a change in migration processes of 0.845 units. Specifically, an increase of one unit in the education variable leads to a 0.845 unit change in migration. This strong association suggests that as the education system grows or improves, migration flows are almost directly proportional. This figure (0.845 units) highlights how education policies significantly affect migration dynamics. For instance, countries that heavily invest in their ed-

ucation sector may experience increased outward migration as students and professionals look for ways to capitalize on their qualifications abroad. Conversely, countries offering attractive educational opportunities may see an influx of students and professionals from other nations, contributing to a global exchange of talent.

The migration affects the higher education sector, which can be understood in two ways. First, migration influences higher education by facilitating the mobility of students, faculty, and researchers. International students bring diversity, global perspectives, and talent to universities. In turn, faculty exchanges and global partnerships enhance the quality of education and research; this circulation of skilled individuals strengthens both the sending and receiving countries' education systems. Second, migration also affects the financial aspects of higher education. International students often pay higher tuition fees, which can be a substantial source of revenue for host countries. Additionally, remittances sent by migrants to their home countries can fund education for family members or support universities through donations and endowments. As education becomes more globalized, financial investments tied to student mobility become crucial for sustaining and expanding educational institutions.

For countries experiencing brain drain due to increased migration of their educated population, the findings suggest the need to improve domestic employment opportunities and provide incentives to retain skilled professionals. This may include investment in research facilities, competitive salaries for highly educated individuals, or policies encouraging return migration. The findings highlight the importance of integrating education policies with migration strategies for countries that attract international students and professionals. These countries need to create pathways for students to transition into the labor market after completing their studies, which not only benefits the host economy but also retains the talent developed in their institutions.

The positive changes in the education sector led to minor, yet observable, shifts in the labor market (by 0.044 units), particularly concerning the unemployment rate and the proportion of individuals with higher education among the employed population. The improvements in the education sector positively impact the labor market, albeit to a small degree. While the primary function of education is to develop human capital, its effect on the labor market is relatively limited but noticeable. Specifically, this involves changes in key labor market indicators like the unemployment rate and the proportion of highly educated individuals within the employed population. In the analysis, the impact of education on the labor market is measured at 0.044 units, indicating that the relationship is positive but weaker compared to the relationship between education and migration.

As people attain higher levels of education, their chances of employment typically increase. Well-educated individuals often have better access to high-quality jobs and are more competitive in the labor market. However, the small change (0.044 units) reflects that education alone cannot solve unemployment issues entirely. Labor market conditions, such as the availability of jobs, economic stability, and industry-specific demand, also play significant roles. One reason for the relatively small shift could be the common mismatch between the skills taught in education systems and those demanded by the labor market. Even though more individuals are receiving higher education, they may not necessarily find jobs that fit their qualifications, which keeps the effect on unemployment minimal. This is particularly evident in countries where the job market struggles to absorb large numbers of graduates in sectors like engineering, technology, or academia.

The relatively modest impact of education on the labor market can be attributed to several important factors. First, education is a long-term investment in human capital, and it often takes time for the full effects to materialize in the labor market. Graduates may take several years to transition from education into stable employment, during which labor market conditions may change.

Second, the strength of the labor market is highly dependent on the economic structure of a country. In developing or transitioning economies, improvements in education may outpace labor market demand, leading to a situation where highly educated individuals struggle to find jobs that match their qualifications.

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Third, some labor markets are highly regulated or rigid, meaning that even if the workforce becomes more educated, this may not immediately translate into employment gains. Structural barriers, such as inflexible job markets, union regulations, or lack of innovation, can limit the impact of education on employment opportunities.

Fourth, in many cases, educational systems do not fully align with the needs of the job market. For instance, graduates may be trained in fields that do not have significant demand, resulting in overqualification or underemployment. This is one reason why the effect of education on labor market indicators, such as the unemployment rate, remains relatively modest.

Policymakers should focus on aligning educational programs with the needs of the labor market. This means promoting vocational training, internships, and other forms of practical experience that enhance employability and ensure that graduates have the skills that are in demand. Governments need to complement education improvements with policies that stimulate job creation, particularly in high-skill sectors. This may involve incentivizing industries to create more jobs for graduates, investing in innovation, or promoting entrepreneurship. To make education more impactful, there should be efforts to reduce the skills mismatch by better understanding labor market trends and ensuring that educational institutions are responsive to these trends.

The analysis shows that a one-unit change in the labor market situation results in a decrease in certain dimensions of migration processes, specifically migration flows, and remittances. Thus, it is reasonable to infer that a deterioration in the labor market conditions tends to trigger positive changes in migration processes.

The statement suggests that poor labor market conditions push individuals to migrate. People may feel compelled to seek better opportunities abroad when the domestic labor market deteriorates due to high unemployment, low wages, poor working conditions, or limited career advancement opportunities. This is especially true in developing countries or regions experiencing economic downturns, where the local labor market cannot provide sufficient jobs or wages that meet the population's expectations or needs. For many individuals, migration is not just a choice but an economic necessity. When labor markets falter, families may send members abroad to find work, often in higher-income countries, with the expectation that they will send back remittances to support those who remain in the home country. This creates a direct link between poor labor market conditions and migration flows.

The inverse relationship between labor market conditions and migration – where worsening conditions lead to more migration – is well-documented and can be explained by the "push-pull" theory of migration. Thus, deteriorating labor markets (push factor) push individuals out of their home countries. High unemployment, lack of job security, and declining wages are major factors that drive people to seek employment abroad. These factors are exacerbated by limited prospects for economic improvement at home, making migration an appealing alternative. At the same time, other countries with more robust economies and better labor market conditions "pull" migrants in. Developed economies often have labor shortages, especially in sectors like healthcare, construction, agriculture, and technology, where migrants can fill gaps left by the local workforce. Migrants are drawn to these opportunities to improve their economic situation.

The analysis shows a decrease in specific dimensions of migration (e.g., migration flows and remittances). While the labor market directly impacts migration, the changes are not always immediate or direct. Labor market deterioration does not lead to an immediate increase in migration flows. It often takes time for individuals to decide to migrate, gather the resources to do so, and navigate legal or logistical challenges. Hence, the relationship is "indirect" rather than instantaneous. Migration is influenced by multiple factors, not just labor market conditions. Personal, social, and political considerations, such as family ties, immigration policies, and the cost of migration, all play a role. This complexity means that the labor market's impact on migration is real but often mediated by other variables.

The findings have significant implications for policymakers. Governments in countries with deteriorating labor markets must find ways to improve

domestic employment opportunities and stem the outflow of talent. This may involve creating better jobs, investing in industry, or developing incentives to retain skilled workers. For countries experiencing increased migration flows, it is important to develop integration policies that help migrants assimilate into the labor market, ensuring they can contribute meaningfully to the economy. Labor policies may also need to adjust to accommodate an influx of foreign workers in ways that avoid social and political tensions.

4. DISCUSSION

This study distinguishes itself from prior research by employing regression analysis coupled with confirmatory factor analysis to examine panel data, which captures socio-economic changes across 14 countries – both EU member states and candidate countries. This methodological approach provides a dynamic framework to evaluate state governance and policy formulation over time while contributing to a deeper understanding of the socio-economic implications of migration. By contrast, the longitudinal approach utilized by Valenta and Drbohlav (2018) relied on statistical datasets and multiple regression analysis to identify determinants of labor market mismatches at the district level in the Czech Republic. Their findings provide a critical foundation for exploring localized disparities in the relationship between education, migration, and labor market performance.

Hayo and Roth (2024) expand the discourse by analyzing the public perception of migration during the refugee influx into Germany between 2015 and 2016. Their use of representative survey data demonstrates that blue-collar workers and individuals without tertiary education are more likely to perceive migrants as competitors in the labor market. This aligns with the broader literature on economic anxieties stemming from migration, particularly in regions facing significant structural labor market shifts. Similarly, Sloka et al. (2024) contribute to the understanding of labor market dynamics by examining human capital development across 13 EU recipient countries, emphasizing regional variations in socio-economic integration processes. Unlike the more geographically restricted analysis of Han and Li (2017), which focuses exclusively on China, the current study incorporates a broader European context, enabling a comparative evaluation of socio-economic transformations across diverse national settings.

Key parameters within this study, including the number of students in higher education, personal remittances, and unemployment rates, are integral to identifying the interplay between tertiary education, migration, and labor market outcomes. These variables allow for a nuanced analysis of how the education–migration–labor market nexus operates within varying socio-economic contexts. In a related vein, Pratomo (2017) measured labor market performance using occupational statuses and earnings, providing valuable insights into economic outcomes for migrant workers in destination countries.

The findings are consistent with prior research that highlights the critical role of governance and policy in shaping labor market outcomes for migrants. For instance, Hayo and Roth (2024) observed that workers in economically vulnerable sectors are more likely to view migrants as competitors, reflecting the structural challenges posed by labor market segmentation. Similarly, Valenta and Drbohlav (2018) identified a mismatch between the educational qualifications of migrants and their professional roles in host countries. Their results indicate that this mismatch is particularly pronounced in economically advanced districts with a high concentration of both domestic and foreign qualified workers, exacerbating competition in the labor market.

This study also contributes to the ongoing discussion by focusing on the interconnections within the education–migration–labor market chain in countries experiencing significant brain drain due to skilled migration. By incorporating a broader set of socio-economic indicators, this paper provides a more comprehensive framework for assessing the structural transformations associated with these interdependencies. This approach aligns with the findings of Pratomo (2017), who emphasized the role of adult education in enhancing income levels and promoting competitiveness in EU countries, particularly in newer member states.

The policy implications are substantial. Integration strategies that facilitate the reintegration of re-

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turning migrants and labor policies designed to attract skilled foreign workers are essential for fostering inclusive economic growth. Furthermore, these policies can enhance workforce adaptability and competitiveness by addressing the disconnect between tertiary education and labor market demands. These findings resonate with the broader literature on migration and labor market integration, offering actionable insights for policymakers in Europe and beyond.

CONCLUSION

The study presents a comprehensive model designed to elucidate the socio-economic transformation components among education–migration–labor market chain for government management. Key findings of confirmatory factor analysis (CFA) reveal that the number of students in higher education is the most influential indicator for education (0.964), paid personal remittances for migration (0.861), and the unemployment rate (0.715) demonstrated the strongest influence for the labor market. The regression analysis reveals a strong positive relationship between education and migration (0.802 units), suggesting that improvements in education significantly drive migration flows. At the same time, education impacts labor market dynamics, as advancements in the sector are associated with increased migration (0.814 units) and slight improvements in labor market conditions (0.045 units). However, declining labor market conditions lead to increased migration, particularly emigration (0.271 units). Moreover, the study demonstrates that the relationship between the labor market and migration is complex, with evidence suggesting that deteriorating labor market conditions can indirectly influence migration in a way that may foster structural improvements.

Thus, these findings emphasize the need to prioritize educational reforms with job creation policies that not only enhance human capital but align with labor market needs and offer incentives to retain talent, especially in high-skill sectors, by fostering innovation and entrepreneurship. For instance, investing in research to attract international students and professionals, aligning education policies with migration strategies, offering competitive salaries, and encouraging return migration seem crucial. Finally, integration policies are key to helping migrants enter the labor market and contribute to the economy, while labor policies should adapt to manage the influx of foreign workers effectively for countries with rising migration.

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