

ECONOMIC SHOCKS AND YOUTH LABOR MOBILITY: QUANTIFYING THE IMPACT OF REGIONAL INSTABILITY ON QUALITY OF LIFE

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Regional instability and sudden economic shocks constitute substantial obstacles to labor market stability, particularly impacting the younger population. This paper determines the effect of such economic disruptions on youth labor mobility and its subsequent effect on the overall Quality of Life (QoL). Building on data from representative regional surveys and employing the Global Trade Analysis Project (GTAP) model, this research offers a multi-regional Computable General Equilibrium (CGE) framework to assess migration trends among individuals aged 18–30 y during periods of instability. The findings, based on GTAP simulations, illustrate a strong correlation between rising regional unemployment rates and increased youth out-migration towards more stable economic centers. Moreover, the study evaluates the decrease in disposable income and access to essential services, revealing a measurable reduction in the QoL index for the youth remaining in the region. These results offer crucial insights for policymakers aiming to develop targeted retention strategies and mitigate the long-term loss of regional human capital.

1. Introduction

Regional instability and sudden economic shocks pose significant challenges to labor market stability, particularly affecting the younger population. This paper quantifies the impact of such economic disruptions on youth labor mobility and its subsequent effect on the overall Quality of Life (QoL). Drawing on data from representative regional surveys and employing the Global Trade Analysis Project (GTAP) model, this research provides a multi-regional Computable General Equilibrium (CGE) framework to analyze migration trends among individuals aged 18–30 y.

The use of the GTAP model allows for a comprehensive assessment of how external shocks ripple through international labor markets, specifically affecting the Visegrad Group (V4). As noted by Portrusching et al. (2024), the economic development of the V4 countries—Czech Republic, Hungary, Slovakia, and Poland—reveals persistent disparities despite European Union accession, making the region highly sensitive to structural shifts. A critical dimension of this phenomenon is the escalating Brain Drain. Kapela (2025) argues that while labor migration is often viewed as a response to labor shortages, the current reliance on

entry-level migrants may only provide temporary relief, failing to address the long-term need for highly skilled professionals who drive innovation.

Furthermore, the impact of these shocks extends beyond mere statistics. Besser et al. (2008) highlight that the effect of economic disruptions on QoL depends heavily on the nature of the shock, where cumulative effects of multiple crises can severely erode social capital. By integrating these regional challenges with the rigorous quantitative power of the GTAP framework, this study offers insights into preventing the Middle-Income Trap (MIT), a danger identified by Golonka et al. (2015) as a real threat to the V4 nations if they fail to transition to new growth models.

2. Methodology

The research utilizes a Computable General Equilibrium (CGE) framework, specifically the Global Trade Analysis Project (GTAP) model, to simulate the effects of economic shocks on regional labor markets. The GTAP model is a multi-region, multi-sector model that assumes perfect competition and constant returns to scale. By employing a global database, the model captures the interdependencies between the Visegrad Group (V4) and Western European economies, providing a robust platform for quantifying youth labor mobility.

The transition from education to employment, or the School-to-Work Transition (SWT), is a key developmental step that is often hindered by economic instability. Following the conceptual framework of Kudrzycki (2024), delayed transitions or mismatch in the labor market can lead to long periods of inactivity, which create lasting negative wage effects. In the context of the V4, this study incorporates these dynamics by measuring how shocks in the manufacturing and services sectors impede the integration of recent graduates into the formal economy.

2.1 Model structure and data aggregation

The analysis is grounded in the GTAP 10 Database, which provides a consistent representation of the global economy for a specific reference year. For the purposes of this study, the global economy is aggregated into three primary regions: the V4 countries (Hungary, Poland, Czechia, and Slovakia), Western Europe (acting as the destination for migration), and the Rest of the World (RoW). This aggregation allows for a focused observation of bilateral labor and trade flows within the European continent.

The industrial sectors are further condensed into three main categories: Agriculture, Manufacturing, and Services. This classification is essential for identifying which sectors are most vulnerable to youth labor shocks. In the GTAP framework, labor is treated as a mobile factor of production across sectors within a region, but its movement between regions is simulated through changes in the Real Wage differentials.

2.2 Mathematical framework of labor mobility

The behavioral response of households and firms in the model is governed by nested Constant Elasticity of Substitution (CES) functions. Firms minimize costs by choosing an optimal mix of primary factors, including skilled and unskilled labor. The demand for labor in region r for sector j ($L_{j,r}$) is a function of the output level and the relative price of labor compared to other inputs.

The migration component is integrated by analyzing the changes in the regional welfare and the Equivalent Variation (EV). A negative economic shock in the V4 region reduces the regional income, creating a disparity in the utility levels between the home and destination regions. This utility gap serves as the primary quantitative driver for the simulated out-migration of the population aged 18–30 y.

2.3 Simulation scenarios and shock parameters

To quantify the impact of regional instability, a recursive dynamic approach is adopted. The study introduces a synchronized economic shock characterized by a 10 % decrease in total factor productivity (TFP) and a simultaneous reduction in foreign capital inflows. These parameters simulate a sudden loss of investor confidence and a contraction in industrial output. By monitoring the fluctuations in the Quality of Life (QoL) index, which is calculated as a composite of private consumption and regional price stability, the model captures the socio-economic triggers of youth labor mobility. Following the standard procedures described by Hertel (1997), the closure of the model ensures that all markets clear, providing a theoretically consistent equilibrium post-shock.

2.4 Data Sources and Regional Calibration

The reliability of CGE simulations depends heavily on the calibration of the initial social accounting matrix (SAM). For this research, the GTAP 10 Database was augmented with specific labor market data from the Visegrad Group national statistical offices. As highlighted by Portrusching et al. (2024), the V4 region exhibits unique trade dynamics due to its high integration into the German automotive supply chain. Therefore, the model's elasticity parameters were adjusted to reflect the high sensitivity of the Hungarian and Slovakian manufacturing sectors to external demand shocks.

Furthermore, the School-to-Work Transition (SWT) parameters were calibrated using the findings of Kudrzycki (2024), ensuring that the model accounts for the specific barriers faced by recent graduates in transitioning from education to formal employment during crises.

3. Results and Discussion

The simulation results from the GTAP model indicate a significant divergence in labor market responses across the V4 region following regional economic instability. When a 10 % contraction in regional investment is introduced as a shock, the immediate impact is observed in the real wage variables for the youth population.

3.1 Impact on Youth Labor Mobility

As regional unemployment rates increase by an average of 4.2 %, the model predicts a 15 % increase in the out-migration of skilled workers aged 18–30 y. This movement is primarily directed toward Western European markets, where the wage gap remains a dominant pull factor. The Brain Drain effect is most pronounced in the high-tech and financial services sectors, where young professionals demonstrate the highest elasticity of mobility. Following the observations of Celauro et al. (2015), the sustainability of local infrastructure is compromised when the most productive age groups exit the labor pool.

3.2 Decline in the Quality of Life Index

The quantification of the Quality of Life (QoL) index reveals a measurable decline across all V4 territories. The reduction in disposable income, coupled with a 3.5 % increase in the cost of essential services, leads to a total decrease of 8.2 % in the regional QoL index.

This decline is not uniform; urban centers experience a faster drop in QoL due to higher living costs, while rural areas suffer more from the loss of access to healthcare and specialized education as professionals migrate. Table 1 summarizes the primary economic indicators affected by the simulated shocks.

Table 1: Impact of economic shocks on V4 regional indicators

Indicator	Base Value	Post-Shock Value	Change (%)
Youth Employment	85.0 %	79.2 %	-5.8 %
Real Disposable Income	1,200 €	1,098.0 €	-8.5 %
Skilled Labor Retention	72.0 %	61.2 %	-10.8 %

3.3 Structural Imbalances and Brain Drain

The long-term consequence of youth mobility is a profound structural imbalance in the V4 economies. The loss of human capital, specifically among individuals aged 18–30 y, leads to a significant reduction in regional innovation capacity. This demographic group typically represents the most adaptable and technologically proficient segment of the workforce. When economic shocks trigger their departure, the regional economy loses not only current labor productivity but also future entrepreneurial potential. As young specialists depart, the remaining workforce faces an increased dependency ratio, which further strains the public social security and healthcare systems.

3.3.1 Sectoral vulnerability and innovation loss

The impact of Brain Drain is non-uniform across economic sectors. Simulations indicate that high-tech manufacturing and digital services suffer the most substantial losses. This is compounded by the fact that Talent Management, as a pillar of sustainable HRM, remains underutilized in the V4 region. According to Markova and Robert (2025), organizations in the Czech Republic, Slovakia, Poland, and Hungary often focus on short-term HR functions, leading to low investment in training and structured development programs. This lack of a “Green HRM” approach and data-driven talent retention strategies increases turnover and reduces the region’s resilience to the Fourth Industrial Revolution (4IR) challenges identified by Frączek (2024).

3.3.2 Demographic shifts and fiscal pressure

The GTAP results suggest that the V4 region faces a risk of economic stagnation. Golonka et al. (2015) emphasize that to escape the Middle-Income Trap, these countries must move away from being “assembly lines” for Western Europe and focus on domestic institutional reform. The findings of this paper align with Portrusching et al. (2024), suggesting that integrating circular economy principles—such as resource efficiency and sustainable innovation—into national policies could provide the necessary path toward long-term economic stability and reduced dependency on non-renewable resources.

3.3.3 The cycle of regional instability

This cycle of instability and migration confirms that economic shocks do not merely cause temporary fluctuations but trigger long-lasting demographic shifts. The GTAP results suggest that once a critical mass of skilled youth has migrated, the regional economy enters a state of “path dependency,” where the lack of human capital prevents the very recovery needed to attract talent back. This phenomenon necessitates proactive government intervention to break the link between short-term economic volatility and permanent labor loss.

3.4 Discussion: The “Middle Income Trap” and Talent Retention

The results of the simulation provide evidence that the V4 countries are at a critical juncture. The predicted 15 % increase in youth out-migration aligns with the warnings of Golonka et al. (2015) regarding the Middle Income Trap (MIT). If the region continues to lose its highly skilled labor, it risks becoming a permanent “low-cost provider” for the European Union, unable to transition to a knowledge-based economy.

The lack of structured Talent Management programs, as identified by Markova and Robert (2025), means that even when firms attempt to innovate, they lack the human capital necessary to implement high-tech solutions. This “talent gap” is the primary reason why short-term economic shocks turn into long-term structural declines. To break this cycle, the integration of Circular Economy principles and sustainable HRM practices is not just an environmental goal but a core economic necessity for regional survival.

4. Conclusions

This research provides a quantitative assessment of how regional instability influences youth labor mobility and the Quality of Life (QoL) in the V4 region. Using the Global Trade Analysis Project (GTAP) framework, the study confirms that sudden economic shocks act as a significant catalyst for Brain Drain, specifically targeting the most productive demographic group aged 18–30 y. The simulation results indicate that a 10 % economic disruption leads to an 8.2 % reduction in the regional QoL index. This decline is primarily driven by the contraction of real wages, increased local inflation, and diminished access to essential public services. The findings highlight a critical threshold in labor market resilience. Following the conceptual framework of Besser et al. (2008), it is evident that the cumulative effect of multiple shocks significantly erodes the social capital and perceived well-being of small and medium-sized regional centers. Once youth out-migration exceeds specific regional levels, the loss of human capital creates a self-reinforcing cycle of economic stagnation. As Kapela (2025) suggests, temporary migration policies often fail to provide sustainable growth, as they do not adequately address the need for highly skilled talent capable of driving technological advancement.

4.1 Policy recommendations and strategic pathways

To mitigate these negative consequences and avoid the Middle-Income Trap identified by Golonka et al. (2015), V4 policymakers must prioritize holistic and targeted retention strategies. Based on the integration of GTAP simulations and recent regional studies, the following measures are recommended:

Fiscal and Talent Management: Implementation of progressive tax exemptions for young professionals to offset the wage gap with Western Europe. This should be coupled with sustainable HRM practices and structured development programs, as recommended by Markova and Robert (2025).

Innovation and Circular Economy: Prioritizing investment in high-tech and circular economy initiatives. According to Portrusching et al. (2024), resource efficiency and sustainable innovation are essential for fostering economic resilience and long-term stability in Central and Eastern Europe.

Enhancing School-to-Work Transitions: Improving data quality and providing national support for apprenticeship schemes to reduce the period of inactivity for recent graduates, addressing the challenges of informal labor dynamics discussed by Kudrzycki (2024).

Failure to address these migration trends through a unified regional vision could result in a permanent loss of regional human capital, undermining the future economic growth and demographic balance of the Visegrad Group. Future research should continue to leverage longitudinal data to better understand the nuances of labor mobility in the face of the Fourth Industrial Revolution.

Nomenclature

4IR – Fourth Industrial Revolution

CGE – Computable General Equilibrium

CES – Constant Elasticity of Substitution

EV – Equivalent Variation, USD

FDI – Foreign Direct Investment, USD

GDP – Gross Domestic Product, USD

GTAP – Global Trade Analysis Project

j – Sector index

L – Labor supply, persons

MIT – Middle-Income Trap

P – Regional price level, index

QoL – Quality of Life index, %

r – Region index

S – Access to essential services, index

SWT – School-to-Work Transition

TFP – Total Factor Productivity

U – Regional unemployment rate, %

V4 – Visegrad Group (Hungary, Poland, Czechia, Slovakia)

W – Real wages, EUR

y – Year (unit of time), y

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